Summary and Analysis of Onboard Observer Collected Data from the 1997/98 Statewide Commercial Weathervane Scallop Fishery

By

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Regional Information Report[1] No. 4K99-63

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

November 1999

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ACKNOWLEDGEMENTS

The following staff from the Alaska Department of Fish and Game are acknowledged for their assistance: Jim Blackburn provided programming and data processing, Meesha Murphy entered the data, and Lucinda Neel assisted in preparation of the report for publication

A special thanks to vessel operators Mr. Michael Andrews, Mr. John Jorgensen, and Mr. Tom Minio for voluntarily releasing their confidential fishing information so that it could be included in this and other reports. The data will help the Alaska Board of Fisheries make informed decisions on management issues in areas where few fishermen participated. This spirit of cooperation from industry is commendable, and important to the successful management of the weathervane scallop resource in the state.

Mr. Kelsey Crago, first mate on the C/P Pursuit, presented a lecture to the scallop observer trainee class at the University of Alaska, North Pacific Fisheries Observer Training center in Anchorage. Topics included life at sea on a scallop vessel, and insights from a vessel operator's perspective.

Mr. Tom Minio, captain of the C/P Pursuit, provided his vessel, crew, gear, and time at no expense to the department, to collect live weathervane scallops for the June scallop observer training class.

Mr. Luke Jadamec of the University of Alaska, North Pacific Fisheries Observer Training Center in Anchorage, Alaska conducted the scallop observer training class.

The following observers were deployed onboard commercial fishing vessels during the 1997/98 scallop season: Mr. Terry Arndt, Mr. Michael Basinger, Mr. Vincent E. Bernard, Mr. George F. Fadler, Mr. Michael B. Hatch, Mr. Kyle Hogrefe, Mr. Jeffrey M. Pitman, Mr. Louis W. Spaner, and Mr. Andreas G. Winter. Their diligence in collecting biological and commercial fishing data under adverse conditions while living at sea for extended periods has produced the data summarized in this report.

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INTRODUCTION

Alaskan weathervane scallop, *Patinopecten caurinus*, populations were first evaluated for their commercial potential by government research and private exploratory cruises beginning in the early 1950s.

Interest in an Alaska fishery began in the late 1960s at the time catches were declining in the U.S. and Canadian scallop fisheries on Georges Bank. As a result, Alaska's commercial fishery began in 1967, when 2 vessels delivered scallops harvested from waters east of Kodiak Island.

The first full year of fishing was 1968, when 19 vessels (New England type scallop vessels, converted Alaskan crab boats, salmon seiners, halibut long liners, and shrimp trawlers) entered the fishery (Kaiser 1986). The commercial fishery progressed through several developmental phases. From 1967 through 1973, virgin scallop beds throughout the state were identified and exploited. This was followed by a period of declining scallop harvests between 1974 and the end of the decade. A smaller, more stable fishery followed through the 1980s. Beginning in 1990, the fishery again expanded with an influx of scallop boats from the East Coast of the United States.

The influx of new vessels into the weathervane scallop fishery prompted concerns from some members of the scallop industry and the Alaska Department of Fish and Game (ADF&G) over crab bycatch and overharvest of the scallop resource. As a result, the weathervane scallop fishery was designated a high impact emerging fishery on May 21, 1993 (Barnhart et al. 1998). The resulting management plan included 100% mandatory onboard observer coverage to monitor crab bycatch as well as collect biological and fishery information. The weathervane scallop observer program began on July 1, 1993.

On March 5, 1997 the National Marine Fisheries Service (NMFS) approved Amendment 2 to the Magnuson-Stevens Fishery Management Plan (FMP), establishing a vessel moratorium. The final rule implementing the vessel moratorium was published on April 11, 1997. A total of 18 vessels qualified for federal moratorium permits. The moratorium period is July 1, 1997 through June 30, 2000, or until repealed or replaced by a permanent license limitation program.

In May 1997 the Alaska legislature approved a statute establishing a scallop vessel moratorium in state waters, which expires June 30, 2001. Ten vessels qualified to fish scallops under the state moratorium program.

Information contained in this report is from the 1997/98 scallop fishing season (July 1, 1997 through February 15, 1998) in the Westward Region and the 1997 scallop fishing season (January 10, 1997 through December 31, 1997) in Yakutat, District 16, and Prince William Sound. Federal waters of the Exclusive Economic Zone (EEZ) from 3 to 200 miles offshore and state waters seaward to 3 miles were concurrently open to weathervane scallop fishing. Figure 1 shows the 9 scallop registration areas in Alaska.

METHODS

Observer Training and Data Collection Procedures

Scallop observer training for the 1997/98 weathervane scallop fishery was conducted at the University of Alaska, Anchorage, North Pacific Fisheries Observer Training Center. A seven day scallop observer training class was held between June 18 and June 26, 1997 for all first-time candidates, candidates with a current NMFS certification, prior shellfish observers whose certification (crab or scallops) had expired due to 12 months of inactivity, and trainee observers whose trainee permit (crab or scallop) had expired. A four day short course was conducted simultaneously between June 23 and June 26, 1997 for observers holding current crab certification status or an active trainee permit. Course material included history of the observer program and Alaska scallop fishery, scallop and crab biology and identification, shellfish regulations, vernier calipers and their use, shell aging and sexing crab, safety, finfish and invertebrate identification, forms and sampling procedures, onboard conduct, and documenting violations.

Live scallops were collected by Captain Tom Minio and the crew of the C/P Pursuit in conjunction with the department scallop biologist. The live scallops were transported by air to the observer training center in Anchorage. This was only the second training class to benefit from the opportunity to examine live scallops in the classroom. Also for the second time since the inception of the scallop observer program, a representative from scallop industry addressed the training class. Mr. Kelsey Crago, first mate on the C/P Pursuit presented a lecture on life at sea on a scallop vessel. His insights from a vessel operator's perspective were enlightening to the class.

At-Sea Catch Sampling

Scallop observers were given detailed instructions on collection of a variety of biological data on a daily basis. The daily goal was to sample one dredge from one tow for haul (species) composition and one dredge from six different tows for crab and halibut bycatch and discarded scallop catch. In addition, procedures called for scallop meat (adductor muscle) recovery data collection to be performed twice a day. Observers were instructed to sample the tows randomly. The decision to sample a particular tow was to be made prior to viewing its contents. Examination of the discarded scallop catch and collection of adductor muscle recovery data were added to the observer duties for the first time this season.

The purpose of the haul composition sampling was to document dredge contents (species composition) by weight. Dredge contents sampled for haul (species) composition were sorted into baskets by species and weighed. Small quantities were weighed entirely, large amounts were subsampled to estimate weight. To estimate the weight of retained scallops, three baskets of scallops retained by the crew were weighed and an average weight calculated. Total weight of retained scallops per dredge was then calculated by multiplying the average weight of a basket of scallops by the total number of baskets. All scallops not retained by the crew (discarded scallops) were weighed directly. Discarded and retained scallop weights were added together to obtain the total weight of scallops captured in the dredge. The protocol for estimating large

volumes of 'other' species encountered was similar to that for scallops, except the average weight of three baskets was multiplied by the observers visual *estimation* of volume on deck. Pacific halibut were measured to the nearest centimeter (cm) from the tip of the nose to the end of the central rays of the caudal fin. Halibut weights were then determined from a length/weight conversion table. In addition to vertebrates and invertebrates, wood, rocks, and man-made debris items were collected and weighed. Man-made debris was counted and classified as plastics, fishing gear (including line), cans, or other.

The observer's goal on each full day of fishing was to sample one dredge from each of six randomly selected tows for crab and halibut bycatch. Observers identified, counted, and recorded the number of crabs and halibut encountered as well as collecting and examining the discarded scallop catch. In addition to identifying and counting the crabs, observers were instructed to examine 100 crabs in detail. Observers began at one end of the bycatch pile and selected the first 100 crabs encountered, avoiding size bias. Carapace measurements, shell age, sex, injuries and mortality were recorded for each crab. Carapace length (CL) was measured on all king and Korean horsehair crabs, and carapace width (CW) was measured on all other crab species. If the dredge contained more then 100 crabs, the remaining crab were counted and speciated only. All Pacific halibut encountered were measured and examined for injuries.

Another goal was to examine the discarded scallop catch in three of the six crab and halibut bycatch tows sampled. After the crew sorted and removed the retained scallop catch from the dredge contents on the deck, observers were instructed to collect all remaining scallops (discarded scallop catch). One basket of discarded scallops was further subdivided into two categories, intact scallops and broken/crushed scallops. If a broken/crushed scallop shell had 50% or more of the body tissue attached to it, it was counted as one scallop. The broken/crushed sample was weighed to the nearest pound and the individuals counted. The intact sample was also weighed to the nearest pound and all individuals counted and measured. The scallop shell height (SH) was measured in a straight line distance perpendicular from the umbo to the most distant point on the outer shell margin using vernier calipers. Any additional baskets of discarded scallops (in excess of the single basket sorted into intact and broken/crushed categories) were weighed to the nearest pound and recorded.

Twenty scallops from the retained catch in each of the six sampled bycatch tows were randomly selected. Shell height, sex, and gonad development data was collected from each individual scallop. Observers were instructed not to bias the sample by size, shape, or position of the scallops selected for sampling. Scallop sex was determined by gonad coloration; male gonads are white and female gonads are pink or orange. Scallop sex is difficult to determine in gonads without gametes due to the lack of gonad coloration. Unidentifiable sexes were assigned to an unknown category. The characteristics employed to determine if a scallop gonad was in a ripe state or not were changed for the 1997/98 season to reduce the amount of subjectivity encountered in previous years. Observers collected the dorsal (left) valve of every tenth scallop examined, as indicated by the shell sampling protocol contained in the scallop manual. A permanent black marker was used to record the haul (tow) number and corresponding shell number from the scallop size frequency form, as well as the statistical area number, vessel ADF&G number, and date on the inside of each shell. Shells were cleaned of mud, flora, and fauna, then dried and stored in muslin bags.

Observers were instructed to collect 10 to 15 dorsal valves from scallops <100 mm SH from each statistical area fished to confirm identification of the first and second annuli. Typically, scallop fishermen do not retain scallops <100 mm SH, so these shells were collected from the discarded catch. Again, pertinent collection information similar to that associated with the retained scallop shell collection was recorded on the inside of each shell.

Twice per day when weather and subsequent sea conditions permitted, observers were instructed to collect scallop meat (adductor muscle) recovery data. Three baskets of retained scallops from a given dredge were individually weighed to the nearest one-quarter pound with a 100 pound Chatillon spring scale and the individual scallops counted (note: during the January fishery in Yakutat and Prince William Sound, individual scallops were not counted). For each sample a crew member from the vessel was selected to conduct the shucking. All meats from the sampled baskets were shucked into a single container and weighed to the nearest one-quarter pound using a Normark 50 pound digital fish scale, or the vessel's platform scale.

Data Collection Forms

All the scallop observer data collection forms, except the scallop meat recovery form, were the same as those used during the 1996/97 season (Barnhart et al. 1998). The scallop meat recovery form was changed with the addition of a column to record the number of individual scallops contained in the sample.

Scallop Fishing Location Mapping

Fishing locations were determined based upon the fishing log form completed by the vessel operator. Major fishing areas were plotted by outlining the highest concentration of fishing activity within a management area. Fishing locations in areas where fewer than three vessels participated remain confidential and were not mapped.

Estimation of Crab and Pacific Halibut Bycatch and Discarded Scallop Catch

Incidental bycatch of Dungeness crabs *Cancer magister,* king crabs *Paralithodes* spp., Tanner crabs *Chionoecetes* bairdi, snow crabs *C. opilio*, and halibut *Hippoglossus stenolepis,* was estimated from the observer data. Each observer's daily goal was to randomly sample one dredge from each of six tows for bycatch. However, due to severe weather conditions and observer health, the number of dredges sampled ranged from 0– 6 on each day when fishing occurred.

For each fishing area, total bycatch (number caught) of each species was estimated by summing all daily bycatch estimates from each vessel, calculated as

$$\hat{B} = \frac{c}{t} \cdot T \cdot D, \tag{1}$$

where

c = catch of a given species (number),
t = sampled dredge·hours,
T = total dredge·hours,
D = average number of dredges fished.

For days when no dredges were sampled, bycatch was estimated by multiplying the average catch rate (number/hour) for the same vessel in the same area by total dredge·hours (one dredge towed for one hour) and average number of dredges fished during the day for which no samples were taken. In one case, there were no data for a vessel fishing in a particular area due to no observer sampling. Daily bycatch for this vessel was estimated by calculating the average catch rates of each species for all vessels fishing in the area during the year, then multiplying these rates by the total dredge·hours and average number of dredges fished each day. Ninety-five percent confidence intervals for the bycatch estimates were calculated by percentile-method bootstrapping (Barnhart et al. 1996).

Sampling effort for scallops discarded by the fleet also ranged from 0–6 dredges per day. Methods for estimating the number and weight of these discards in each fishing area were similar to those used for bycatch. Number (or weight) of intact (or broken) scallops in the sampled dredges on each vessel each fishing day were estimated by

$$\hat{X} = \frac{x}{W}(W + R), \tag{2}$$

where
x = number (or weight) of intact (or broken) scallops in subsampled baskets,
W = weight of subsampled baskets,
R = weight of remaining scallops in sampled dredges.

Estimates for each day were obtained by substituting **Error! Bookmark not defined.**$\hat{X}$ for c in equation (1), and area estimates were obtained by summing over all vessel and days. Days with no sampling were handled as above, using average catch rates (number or weight per hour) by the same vessel in the same area, or by overall average rates in the case where no sample data were available. Confidence intervals were calculated by percentile-method bootstrapping.

Height Frequency Distributions of the Scallop Catch

Height frequency distributions of the scallop catch were displayed in 4 different ways. Histograms of intact discarded scallops and all retained scallops were generated for each management area by apportioning the observer data into 5 mm bins. Male and female height frequencies for each area were compared through line plots that were also based on 5 mm bins. For areas where 1000 or more of each retained and discarded scallop shell heights were measured, height frequency of the total catch was estimated by resampling from the observer data. Ten thousand measurements were randomly sampled using proportions of retained and discarded scallop catch in each area from the fishing log and discard estimation. These measurements were apportioned to 3 mm bins and plotted as histograms with different symbols for the retained and discarded portions of the catch.

Updating of Summary Tables

Summary statistics from all years of the observer program (Tables 22, 23, and 24) were updated in 1999. In addition to tabulating the 1997/98 data, this included replacement of missing values from earlier summary tables (Barnhart and Sagalkin 1998) and recalculation of estimated crab and halibut bycatch for all areas in 1993 and for Yakutat (Area D and D16 in 1994 and 1995), and Prince William Sound (Area E) in 1995. Dungeness crab bycatch was calculated for all management areas for all years beginning with 1993.

RESULTS

Nine different observers were deployed aboard six different vessels during the 1997/998 statewide scallop season. Vessel days, described as all days from observer briefing through debriefing, totaled 715. A total of 542 days of fishing were observed (an observed day is a day with at least one sampled tow), from the 583 days on which fishing occurred. Not all fishing days were observed due to severe weather conditions and observer health. Vessel operators recorded 9,514 hauls in their logbooks, of which approximately 30% were sampled by observers. Approximately 153,000 scallops and 27,000 Tanner and snow crabs were measured. A total of 52 separate briefings and debriefings, not including mid-trip debriefs, were conducted statewide which included 8 for Yakutat (Area D and D16 combined), 2 for Prince William Sound (Area E), 24 for Kodiak (Area K), 12 for the Alaska Peninsula (Area M), 2 for Dutch Harbor (Area O), and 4 for the Bering Sea (Area Q).

The scallop fleet fished 71 different statistical areas statewide extending from the Bering Sea to Yakutat. Figure 2 shows where the majority of fishing occurred. Similar areas were fished during the 1993/94 season (Urban et al. 1994), as well as the 1994/95 season (Barnhart et al. 1996) and 1996/97 season (Barnhart and Sagalkin 1998).

Commercial Scallop Fishery

Catch and Effort

Total scallop dredging effort by the observed fleet was 17,299 dredge-hours, where a dredge-hour equals one dredge towed for 60 minutes. Typically two dredges were towed simultaneously. The highest effort level occurred in the Kodiak Area with 8,442 dredge-hours, which included 2,603 dredge-hours in the Northeast District, 5,490 dredge-hours in the Shelikof district, and 349 dredge-hours in the Semidi District. The second highest effort level occurred in the Yakutat Area with 4,517 dredge-hours which included 561 dredge-hours in District 16 and 3,956 dredge-hours in Yakutat. This was followed by 2,246 dredge-hours in the Bering Sea Area, 1,752 dredge-hours in the Alaska Peninsula Area, and 171 dredge-hours from the Dutch Harbor Area (Figure 3).

Total round weight of retained scallops reported in vessel fishing logs was 9,905,881 pounds. The Kodiak Area accounted for the largest amount (4,306,399 pounds) which included 1,143,926 pounds from the Northeast District, 3,101,153 from the Shelikof District, and 61,320 from the Semidi Area. This was followed by the Yakutat Area with 3,548,742 pounds which included 265,882 pounds from District 16 and 3,282,860 pounds from Yakutat. The Bering Sea harvest was 1,082,825 pounds followed by the Alaska Peninsula Area with 654,960 pounds and the Dutch Harbor Area with 55,725 pounds (Figure 4).

Shucked meat weights as reported on fish tickets totaled 798,757 pounds. The Kodiak Area harvest of 360,519 pounds was the largest reported in the state and included 95,858 pounds from the Northeast District, 258,346 pounds from the Shelikof District, and 6,315 pounds from the Semidi District. The Yakutat Area harvest of 265,830 pounds was second highest and included 22,020 pounds from District 16 and 243,810 from Yakutat. The Bering Sea Area harvest was 97,002 pounds, while the Alaska Peninsula Area contributed 51,616 pounds, the Prince William Sound Area 18,000 pounds, and the Dutch Harbor Area 5,790 pounds.

Scallop catch-per-unit-effort (CPUE), expressed in round weight of retained scallops per dredge-hour (lbs/drg·hr), was highest in the Prince William Sound Area at 1,504 lbs./drg·hr (Figure 5). This was followed by the Yakutat Area with 786 lbs/drg·hr which included District 16 with 474 lbs/drg·hr and Yakutat with 830 lbs/drg·hr. CPUE in the Kodiak Area averaged 510 lbs/drg·hr which included the Northeast District with 439 lbs/drg·hr, Shelikof District with 565 lbs/drg·hr, and the Semidi District with 176 lbs/drg·hr. The Bering Sea Area produced 482 lbs/drg·hr, Alaska Peninsula Area 374 lbs/drg·hr, and Dutch Harbor Area 326 lbs/drg·hr.

Fishing effort was expressed in two ways: distance towed and area dredged (Table 1). The highest effort was in the Kodiak Area with 20,847 tow miles covering 102 square miles. This was followed by the Yakutat Area with 10,996 tow miles covering 54 square miles, Bering Sea with 5,905 tow-miles covering 29 square miles, Alaska Peninsula Area with 4,457 tow miles covering 21 square miles, Dutch Harbor Area with 508 tow miles covering 2 square miles, and Prince William Sound with 410 tow miles covering 2 square miles.

The average depth fished during the 1997/98 fishing season was 47 fathoms. Both the minimum and maximum depths fished occurred in the Shelikof District of the Kodiak Area, and ranged from 18 to 90 fathoms (Table 2). Average fishing depth ranged from 36 fathoms in Prince William Sound to 57 fathoms in the Alaska Peninsula Area.

Discarded Scallop Catch

Observers counted and weighed approximately 108,000 intact and 36,000 broken discarded scallops during the 1997/98 fishing season (Table 3). Discarded scallop catch estimates show the combined intact shell and broken shell discard to be 5,003,805 individual scallops with a combined weight of 1,254,382 pounds (Table 4). Broken shell scallops accounted for 1,150,658 individuals with a weight of 363,140 pounds while intact shell scallops numbered 3,852,912 individuals with a weight of 891,185 pounds. Approximately 11.2 % of the statewide scallop catch by weight (round weight of scallops) was discarded. Discards were composed of 29 % broken shell scallops and 71 % intact shell scallops.

Further examination of the estimated discarded catch weight shows the combined Yakutat Area accounted for 62% of the statewide total. Of that 62%, District 16 produced 4% and Yakutat 96%. A substantial amount of the statewide total (approximately 34%) was from Kodiak Area, with the majority of the Kodiak discarded scallop weight (69%) coming from the Shelikof District. Both the Bering Sea and the Alaska Peninsula Areas accounted for approximately 3% of the statewide total, followed by the Dutch Harbor Area with 1.5%, and Prince William Sound with .005%.

The average weight of individual discarded scallops (intact and broken scallops combined) ranged from 0.24 pounds in District 16 to 0.61 pounds in the Semidi District (Table 5). Statewide, the weight of broken scallops averaged .40 while intact scallops averaged .31 pounds.

Figures 6-13 depict shell height distributions of intact discarded scallops measured by observers. Average shell heights of intact discarded scallops ranged from 89 mm in the Shelikof District to 122 mm in the Semidi District. Scallops larger then 100 -110 mm SH are typically retained in the commercial fishery.

Retained Scallop Catch

Observers measured and sexed almost 45,000 scallops from the retained catch. Table 6 summarizes sex composition and mean shell height by management area. Caution should be used interpreting sex composition data in areas with a high percentage of scallops in the undetermined sex category. However, in general there were more males than females identified in the retained scallop samples.

Figures 14-31 depict shell height distributions observed in the retained scallop catch. Two figures are associated with each management area or district; a histogram containing the shell height distribution of all scallops (males, females, and undetermined sex), and a shell height distribution line plot that compares males and females. The average shell height of retained scallops ranged from 120 mm in Yakutat to 152 mm in the Bering Sea. Large between-sex differences in shell height distributions occurred in the Northeast District (Figure 21), the Shelikof District (Figure 23), and the Bering Sea (Figure 29). In all three areas females were larger in size then males.

Adductor muscle (meat) recovery from the commercial catch averaged 9.4% statewide, and was highest in the Semidi District at 11.4 % (Table 7). The second highest meat recovery occurred in the Dutch harbor Area (10.6%) followed closely by the Northeast District of Kodiak with 10.1%. The lowest meat recovery occurred in the Alaska Peninsula (8.7%) and the Bering Sea (8.8%).

Combined Retained and Discarded Scallop Catch

Figures 32-37 depict the estimated shell height distributions of the combined retained and discarded catch in each management area/district where adequate data were available. The histograms indicate that in general, the smallest scallops were caught in the Yakutat Area and the largest in the Bering Sea (where the lowest meat recovery was recorded). District 16 was similar to the Yakutat Area in that a substantial number of small scallops in the 100-115 mm size range are retained. Typically, in other areas of the state, fewer small scallops were retained.

Caution should be exercised when interpreting the discarded scallop catches because small scallops (<100 mm SH) may fall through the dredge rings and are therefor not captured at the same rate as the larger sized scallops. The histograms also show that more small sized (<100 mm SH) scallops are discarded in the Yakutat Area then in all other areas. A moderate amount of small scallops were discarded in the Kodiak and the Alaska Peninsula Areas, while very few small scallops were captured in the Bering Sea.

Scallop Fishery Bycatch

A variety of marine vertebrates, invertebrates, and debris (rocks, kelp, empty shells, etc.) are caught incidentally in scallop dredges however, weathervane scallops predominate catches (Table 8). In Prince William Sound weathervanes comprised the largest percentage of the catch by weight (96.5%), in contrast to the Semidi District of the Kodiak Area where weathervanes comprised only 21.1% of the catch by weight.

The relative weight of bycatch including prohibited species, other commercial species, and miscellaneous noncommercial species and items (including kelp, rocks, man-made debris, etc.) caught incidentally in scallop dredges varied widely by geographic area. The three most frequently caught species or items by weight in District 16 were weathervane shells (5.4%), kelp/rocks (3.2%), and skates (2.2%) (Table 9). In Yakutat empty weathervane shells (6.7%), starfish (5.0%), and kelp/rocks (3.0%) were the top three items caught (Table 10). Bycatch was low in Prince William Sound with starfish accounting for 1.7%, weathervane shells 0.6%, and kelp/rocks 0.3% (Table 11). In the Kodiak Area the three most frequently caught species or items by District were: Northeast District, starfish (20.7%), kelp/rocks (5.1%), and empty weathervane shells (4.3%) (Table 12); Shelikof District, kelp/rocks (7.1%), empty weathervane shells (4.7%) and skates (2.5%) (Table 13); Semidi District, kelp/rocks (34.0%), starfish (21.5%), and empty weathervane shells (3.0%) (Table 14). In the Alaska Peninsula Area starfish accounted for 24.0% of the catch followed by kelp/rock at 4.4% and empty weathervane shells at 3.7% (Table 15). In the Bering Sea snow crab accounted for 5.7% of the catch followed by skates at 4.3% and arrowtooth flounder at 3.9% (Table 16). In the Dutch Harbor Area kelp/rocks accounted for 50.3%, rock sole 4.9%, and starfish 2.6% (Table 17).

In District 16 nontarget commercial species (e.g. Pacific cod, flatfish, and crabs) accounted for 2.2% of the twenty most frequently caught species, followed by Yakutat with 1.3%, Prince William Sound 0.67%, Northeast District 7.4%, Shelikof District 5.1%, Semidi District 7.2%, Alaska Peninsula 6.4%, Bering Sea 17.5% and Dutch Harbor 7.1%.

Crab Bycatch Estimates

The highest bycatch of *Chionocetes* crabs occurred in the Bering Sea with 195,345 snow/hybrid crabs and 28,446 Tanner crabs taken as bycatch (Table 18). The second highest bycatch of Tanner crabs occurred in the Shelikof District of Kodiak where 36,744 were taken. The third highest bycatch of Tanner crabs came from the Alaska Peninsula Area where 21,971 crabs were caught. This was followed by the Dutch Harbor Area with 12,582, the Northeast District of Kodiak with 11,914, Semidi District of Kodiak with 8,500, Yakutat with 5,884, and District 16 with 129 Tanner crabs. No Tanner crab bycatch occurred in Prince William Sound.

One king crab was taken as bycatch in the Semidi District and one in the Dutch Harbor Area. No king crab were reported from the remainder of the state. As a condition of the vessel registration permit, the vessel operator and crew are required to show every king crab caught to the observer for sampling. Because few king crab were caught, standard estimating procedures were not employed.

Incidental Dungeness crab bycatch was highest in the Shelikof District where an estimated 4,359 crabs were taken. An estimated 856 Dungeness were taken in the Semidi District, and 277 were caught in the Yakutat Area. No Dungeness crabs were caught in the remainder of the state.

Tanner and Snow Crab Bycatch Mortality. Observed on-deck mortality of Tanner crab in the scallop fishery varied from 21% in the Alaska Peninsula to 65% in District 16 (Table 19). In the Bering Sea, combined Tanner and snow crab mortality was 53% (Tanner crab mortality was 44% and snow crab mortality 55%). Tanner crab mortality was 44% in the Dutch Harbor Area, 43%, in the Semidi District, 32% in Yakutat, 28% in the Northeast District and 22% in the Shelikof District. The overall statewide mortality rate for Tanner and snow crabs was 39%.

Size Distribution of Tanner and Snow Crab Bycatch. Tanner crab bycatch in the Yakutat Area (District 16 and Yakutat combined) was an estimated 6,013 crabs, of which 770 were measured and sexed (Figure 38). Observer bycatch samples were predominated by small, immature crabs. The average size of the 507 measured males was 41 mm CW, and the average size of the 263 measured females was 42 mm CW. No legal sized (≥140 mm CW) Tanners were sampled.

Tanner crab bycatch in the Northeast District of the Kodiak Area was estimated to be 11,914 crabs of which 2,006 were measured and sexed (Figure 39). Observer bycatch samples were predominated by small, immature crabs of both sexes. The average size of the 1,021 measured males was 54 mm CW, and the average size of the 985 measured females was 48 mm CW. Seventeen legal sized (≥140 mm CW) Tanners were measured.

Tanner crab bycatch in the Shelikof District of the Kodiak Area was estimated to be 36,744 crabs of which 5,155 were measured and sexed (Figure 40). Observer bycatch samples were predominated by female crabs between 70 – 110 mm CW. The average size of the 1,771 measured males was 79 mm CW, and the average size of the 3,384 measured females was 82 mm CW. There were 102 measured males ≥140 mm CW (legal size).

Estimated Tanner crab bycatch in the Semidi District of the Kodiak Area was 8,500 crabs of which 849 were measured and sexed (Figure 41). Observer bycatch samples were predominated by small, immature male and female crabs in the 10 – 40 mm CW size range. The average size of the 411 measured males was 33 mm CW, and the average size of the 438 measured females was 37 mm CW. Two legal sized (≥140 mm CW) Tanners were measured.

Estimated Tanner crab bycatch in the Alaska Peninsula Area was 21,971 crabs of which 3,101 were measured and sexed (Figure 42). Observer bycatch samples were predominated by small, immature male and female Tanner crab ≤41 mm CW. The average size of the 1,589 measured males was 42 mm CW, and the average size of the 1,512 females measured was 41 mm CW. One legal sized male (≥140 mm CW) was measured.

Estimated Tanner crab bycatch in the Bering Sea Area was 28,446 crabs of which 1,826 were measured and sexed (Figure 43). Observer bycatch samples were predominated by female Tanner crabs between 75 – 110 mm CW. The average size of the 967 measured males was 104 mm CW, the average size of the 859 measured females was 83 mm CW. There were 13 measured males ≥140 mm CW (legal size).

The snow crab/hybrid bycatch estimate in the Bering Sea Area was 195,345 crabs of which 11,679 were measured and sexed (Figure 44). Observer bycatch samples were predominated by male crabs 60 – 125 mm CW and females 55 – 80 mm CW. The average size of the 10,114 measured males was 92 mm CW, and the average size of the 1,565 measured females was 69 mm CW.

Estimated Tanner crab bycatch in the Dutch Harbor Area was 12,582 crabs of which 739 were measured and sexed (Figure 45). Observer bycatch samples were predominated by small, immature male and female crab ≤36 mm CW. The average size of the 333 measured males was 29 mm CW, and the average size of the 406 measured females was 36 mm CW.

Tanner and Snow Crab Bycatch Relative to the Scallop Harvest. The number of Tanner and snow crabs caught per pound of retained scallop meats (crabs/lb meats) was the highest in the Bering Sea at 2.31crabs/lb meats (Figure 46). The Bering Sea Area was followed closely by the Dutch Harbor Area at 2.17 crabs/lb meats, and the Semidi District at 1.35 crabs/lb meats. In District 16, Yakutat, Prince William Sound, Northeast and Shelikof Districts of Kodiak, and the Alaska Peninsula the rate was less then 0.5 crabs/lb meats.

Pacific Halibut Bycatch Estimates and Release Conditions

Estimated Pacific halibut bycatch ranged from a high of 665 individuals in the Northeast District of Kodiak, to a low of 8 individuals in Prince William Sound.

The number of halibut observed in sampled hauls totaled 259, and ranged from 2 in Prince William Sound to 87 in the Northeast District of Kodiak (Table 20). Of the 259 halibut observed in sampled tows, 87 (34%) were released in excellent condition, 59 (23%) were released in good condition, 28 (11%) were released in fair condition, 29 (11%) were released in poor condition, 39 (15%) were released dead, and 17 (7%) were previously dead (obviously not killed in the current haul).

SUMMARY

A summary of the 1997/98 statewide weathervane scallop fishing season is presented in Table 21. A total of 792 days of fishing were observed. Vessel operators reported harvesting 9,905,881 pounds (round weight) of scallops or 780,757 pounds of shucked meats, from a total of 25,570 dredge-hours. CPUE ranged from 176 lbs./drg·hr in the Semidi District of the Kodiak Area to 1,504 lbs./drg·hr in Prince William Sound. Estimated *Chionoecetes* crab bycatch totaled 378,673 crabs and ranged from 0 crabs in Prince William Sound to 223,791 crabs in the Bering

Sea. Estimated bycatch of halibut totaled 3,230 individuals and ranged from 8 in Prince William Sound to 665 in the Northeast District of the Kodiak Area.

Statewide commercial fishery statistics and observer data from the 1993/94 through 1997/98 seasons are summarized in Table 22 (District 16, Yakutat, and Prince William Sound), Table 23 (Kodiak Area), and Table 24 (Alaska Peninsula, Bering Sea, and Dutch Harbor Areas). The tables include season dates, effort levels, crab bycatch limits, crab and halibut bycatch estimates, scallop harvest, percent meat (adductor muscle) recovery, estimated number and weight of the discarded scallop catch, and average size of the retained scallop catch.

The focus of the onboard scallop observer program is to monitor bycatch and collect biological and commercial fishing information on the weathervane scallop. Onboard sampling is designed to answer questions necessary for management of the resource. Observer data provides information on scallop bed locations, scallop recruitment and reproduction, and helps define the time period when product quality is highest. Efforts continue to use data from the observer program to estimate scallop abundance with a fishery based stock assessment model. Aging of scallop shells collected by observers is ongoing and will increase the understanding of the age structure and composition of the populations.

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Table 1. Distance towed and bottom area dredged during the 1997/98 fishing season.

MANAGMENT AREA	Tow Miles[a]	Square Miles[b]
Yakutat	9,626	47
District 16	1,370	7
Yakutat Total	10,996	54
Prince William Sound	410	2
Kodiak, Northeast District	6,512	32
Kodiak Shelikof District	13,442	66
Kodiak Semidi District	893	4
Kodiak Total	20,847	102
Alaska Peninsula	4,457	21
Bering Sea	5,905	29
Dutch Harbor	508	2
TOTAL	43,123	210

[a]Nautical miles towed, regardless of the number of dredges.
[b]Square nautical miles.

Table 2. Minimum, maximum, and average depth fished during the 1997/98 fishing season.

MANAGEMENT AREA	DEPTH[a] Minimum	Maximum	Average
Yakutat	27	79	40
District 16	28	55	37
Yakutat Average	28	67	39
Prince William Sound	33	40	36
Kodiak, Northeast District	30	87	51
Kodiak, Shelikof District	18	90	56
Kodiak, Semidi District	25	72	46
Kodiak Average	24	83	51
Alaska Peninsula	30	86	57
Bering Sea	41	66	54
Dutch Harbor	40	88	48
AVERAGE	30	74	47

[a]Depth in fathoms.

Table 3. Number and weight of discarded scallops as recorded by scallop observers during the 1997/98 fishing season.

MANAGEMENT AREA	Number of Sampled Scallops		Weight of Sampled Scallops[a]	
	Intact	Broken	Intact	Broken
Yakutat	39, 365	16, 804	9, 690	4, 080
District 16	6, 010	1, 786	1, 352	420
Yakutat Total	45, 375	18, 590	11, 042	4, 500
Prince William Sound	3	31	NA	NA
Kodiak, Northeast District	14,347	4,817	2,632	1,626
Kodiak, Shelikof District	33, 857	6, 271	6, 925	2, 503
Kodiak, Semidi District	173	110	81	51
Kodiak Total	48, 377	11, 198	9, 638	4, 180
Alaska Peninsula	6, 166	2, 194	1, 308	682
Bering Sea	6, 402	3, 358	1, 792	1, 391
Dutch Harbor	1, 501	439	410	118
TOTAL	107, 824	35, 810	24, 190	10, 871

[a]Weight in pounds.

Table 4. Estimated number and weight[a] of intact and broken scallops in the discarded scallop catch during the 1997/98 scallop fishery.

Management Area	Intact Number		Intact Weight		Broken Number		Broken Weight		Total Number Intact+broken	Total Weight Intact+broken
	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI		
Yakutat	2,054,273	1,831,618-2,316,687	528,575	467,590-600,662	732,179	676,204-811,968	217,226	194,127-252,649	2,786,453	745,801
District 16	111,643	87,472-164,508	25,412	19,873-37,410	31,750	25,612-43,788	7,352	5,550-10,376	143,392	32,764
Yakutat Total	2,165,916	1,919,090-2,481,195	553,987	487,463-638,072	763,929	701,816-855,756	224,577	199,676-263,025	2,929,845	778,565
Prince William Sound	NA	NA	NA	NA	NA	NA	NA	NA	236	57
Kodiak										
Northeast District	403,593	375,656-436,675	73,441	68,464-79,816	128,546	119,558-136,357	41,715	38,961-43,877	532,140	115,156
Shelikof District	1,031,550	955,822-1,115,896	200,556	187,660-213,651	158,354	149,566-164,889	62,291	58,672-64,459	1,189,903	262,847
Semidi District	3,524	2,153-4,843	1,635	1,168-2,081	2,307	1,613-3,006	1,080	810-1,361	5,831	2,716
Kodiak Total	1,438,667	1,333,631-1,557,413	275,633	257,291-295,548	289,207	270,737-304,252	105,086	98,443-109,697	1,727,874	380,718
Alaska Peninsula	120,081	112,033-127,243	25,026	23,399-26,660	43,413	39,551-47,086	13,193	12,189-14,087	163,494	38,219
Bering Sea	75,122	67,161-83,470	21,820	19,844-24,003	39,493	36,253-43,076	16,442	15,237-18,060	114,614	38,262
Dutch Harbor	53,126	43,354-63,235	14,720	11,955-17,728	14,616	11,750-16,995	3,841	3,109-4,459	67,742	18,561
TOTAL	3,852,912		891,185		1,150,658		363,140		5,003,805	1,254,382

[a]Weight in pounds of unshucked scallops
NA = Not Applicable

Table 5. Average weight of individual intact and broken scallops from observer sampled discarded scallop catch during the 1997/98 fishing season.

MANAGEMENT AREA	WEIGHT[a]		
	Intact Scallops	Broken Scallops	Average
Yakutat	0.26	0.28	0.27
District 16	0.23	0.25	0.24
Yakutat Average	0.25	0.27	NA
Prince William Sound	NA	NA	NA
Kodiak, Northeast District	0.25	0.40	0.33
Kodiak, Shelikof District	0.24	0.43	0.34
Kodiak, Semidi District	0.59	0.63	0.61
Kodiak Average	0.36	0.49	NA
Alaska Peninsula	0.25	0.39	0.32
Bering Sea	0.29	0.42	0.36
Dutch Harbor	0.36	0.37	0.37
AVERAGE	0.31	0.40	NA

[a]Weight in pounds.
NA = Not Applicable

Table 6. Sex composition and mean shell height from observer sampled retained scallop catch during the 1997/98 fishing season.

Management Area or District	Number of Samples	% in Sample			Mean Shell Height		
		Males	Females	Undetermined	Males[a]	Females[a]	Undetermined
District 16	1,019	53	46	0.4	126	129	143
Yakutat	7,789	53	47	0.3	119	120	129
Prince William Sound	742	50	50	0	122	123	0
Kodiak, Northeast District	7,208	39	26	35	134	143	144
Kodiak, Shelikof District	16,371	47	44	9	135	144	129
Kodiak, Semidi District	1,066	50	49	1	148	146	159
Alaska Peninsula	5,602	53	39	8	133	134	143
Bering Sea	4,725	19	21	60	149	155	151
Dutch Harbor	267	50	39	11	126	128	131
Overall mean shell height					132	137	143

[a]Shell height in mm

Table 7. Percent scallop meat recovery by management area during the 1997/98 fishing season.

MANAGEMENT AREA	Number of Samples	PERCENT RECOVERY Mean	Median	95% Confidence Interval for Mean
Yakutat	78	9.0	9.4	8.7 - 9.2
District 16	12	9.9	10.2	9.6 - 10.2
Prince William Sound	11	9.6	9.8	9.1 - 10.1
Kodiak, Northeast District	81	10.1	9.9	9.9 - 10.3
Kodiak, Shelikof District	228	9.4	9.8	9.2 - 9.5
Kodiak, Semidi District	19	11.4	11.7	10.3 - 12.4
Alaska Peninsula	57	8.7	8.6	8.3 - 9.0
Bering Sea	86	8.8	8.8	8.7 - 8.9
Dutch Harbor	5	10.6	10.5	NA
OVERALL	577	9.4	9.5	9.3 – 9.5

NA = Not Applicable

Table 8. Summary of the most frequently caught species, by percent weight in sampled dredges, as recorded by scallop observers during the 1997/98 scallop fishery.

	Management Area / District								
	Yakutat Area			Kodiak Area			Alaska	Bering	Dutch
Species Catergory	District 16	Yakutat	PWS	Northeast	Shelikof	Semidi	Peninsula	Sea	Harbor
weathervane scallops	72.5	81.1	96.5	58.1	77.8	21.1	55.8	73.9	50.3
PROHIBITED SPECIES BYCATCH									
Tanner crab, *C. bairdi*	<0.1	<0.1	0	0.1	0.4	1.9	0.2	0.9	0.4
Snow crab, *C. opilio*[a]	0	0	0	0	0	0	0	5.7	0
king crab	0	0	0	0	0	0	0	0	0
Dungeness crab	0	<0.1	0	0	<0.1	0.5	0	0	0
Pacific halibut	0	0.1	0	0.5	<0.1	<0.1	0.6	<0.1	0.2
OTHER COMMERCIAL SPECIES									
skates	2.2	1.7	0.3	3.0	2.5	1.6	0.4	4.3	0.3
arrowtooth flounder	0.3	0.2	<0.1	1.1	0.9	0.2	2.2	3.9	<0.1
rock sole	0.8	0.2	0	0.8	<0.1	0.5	0.7	<0.1	4.9
Dover sole	<0.1	0	<0.1	0.7	0.3	0	<0.1	0	0
yellowfin sole	0.2	0.1	0	0	0	0.5	<0.1	0.2	0
rex sole	<0.1	<0.1	<0.1	0.2	<0.1	0	0	0.1	0.1
flathead sole	0.2	0.1	0	0.1	0.5	1.3	1.1	1.1	<0.1
butter sole	<0.1	0.1	0	<0.1	0	0.4	<0.1	0	0
Pacific cod	0.1	0.1	0	0.3	0.1	0	0.5	0.8	0.3
starry flounder	<0.1	0.1	0	0	0	2.6	<0.1	0	0
walleye pollock	0	0	0	<0.1	0	0	0	<0.1	0
bay scallops	0	<0.1	0	<0.1	<0.1	<0.1	0.5	<0.1	0.2
sea urchins	0	0	0	<0.1	<0.1	<0.1	0.5	<0.1	0.7
octopus	<0.1	<0.1	0.3	0.6	<0.1	0.5	0.2	0.1	<0.1
Alaska plaice	0	0	0	0	0.2	0.2	0.1	<0.1	0
sea cucumber	0	0	0	<0.1	<0.1	<0.1	<0.1	0	0
MISCELLANEOUS									
starfish	0	5.0	1.7	20.7	2.3	21.5	24.0	0.6	2.6
basket star	0	<0.1	0	0.1	0	0	0.5	0	0.0
weathervane shells	5.4	6.7	0.6	4.3	4.7	3.0	3.7	3.5	2.3
kelp, rocks, etc.	3.2	3.0	0.3	5.1	7.1	34.0	4.4	0.7	50.3
man-made debris	<0.1	<0.1	0	0.2	<0.1	1.1	1.9	0.4	<0.1

[a] Includes 0.6% hybrid Tanner crab.

Table 9. Twenty most frequently caught species by weight as recorded by scallop observers during the 1997 District 16 scallop season.

Rank	Species	Scientific Name	% of Total Catch
1	weathervane scallops	*Patinopecten caurinus*	72.5%
2	skate egg case	Family Rajidae	8.9%
3	weathervane shells	*P. caurinus*	5.4%
4	starfish	Class Stelleroidea	5.2%
5	kelp, rocks, etc.		3.2%
6	skates	Family Rajidae	2.2%
7	rock sole	*Lepidopsetta* spp.	0.8%
8	lingcod	*Ophiodon elongatus*	0.6%
9	arrowtooth flounder	*Atheresthes stomias*	0.3%
10	flathead sole	*Hippoglossoides elassodon*	0.2%
11	yellowfin sole	*Limanda aspera*	0.2%
12	sea anemone	Order Actinaria	0.2%
13	Pacific cod	*Gadus macrocephalus*	0.1%
14	hermit crab	Family Paguridae	0.04%
15	box crab	*Lopholithodes* spp.	0.03%
16	debris, plastics		0.02%
17	starry flounder	*Platichtys stellatus*	0.02%
18	bristle worm	*Aphrodita negligens*	0.01%
19	lyre crab	*Hyas lyratus*	0.01%
20	Dover sole	*Microstomus pacificus*	0.01%

Table 10. Twenty most frequently caught species by weight as recorded by scallop observers during the 1997 Yakutat Area scallop season.

Rank	Species	Scientific Name	% of Total Catch
1	weathervane scallops	*Patinopecten caurinus*	81.1%
2	weathervane shells	*P. caurinus*	6.7%
3	starfish	Class Stelleroidea	5.0%
4	kelp, rocks, etc.		3.0%
5	skates	Family Rajidae	1.7%
6	skate egg case	Family Rajidae	0.9%
7	arrowtooth flounder	*Atheresthes stomias*	0.2%
8	lingcod	*Ophiodon elongatus*	0.2%
9	rock sole	*Lepidopsetta* spp.	0.2%
10	sea anemone	Order Actinaria	0.1%
11	Pacific Halibut	*Hippoglossus stenolepis*	0.1%
12	flathead sole	*Hippoglossoides elassodon*	0.1%
13	Pacific cod	*Gadus macrocephalus*	0.1%
14	starry flounder	*Platichtys stellatus*	0.1%
15	butter sole	*Isopsetta isolepis*	0.1%
16	hermit crab	Family Paguridae	0.1%
17	yellowfin sole	*Limanda aspera*	0.1%
18	bristle worm	*Aphrodita negligens*	.03%
19	rex sole	*Glyptocephalus zachirus*	.03%
20	english sole	*Parophrys vetulus*	.03%

Table 11. Twenty most frequently caught species by weight as recorded by scallop observers during the 1997 Prince William Sound scallop season.

Rank	Species	Scientific Name	% of Total Catch
1	weathervane scallops	*Patinopecten caurinus*	96.5%
2	starfish	Class Stelleroidea	1.7%
3	weathervane shells	*P. caurinus*	0.6%
4	skates	Family Rajidae	0.3%
5	kelp, rocks, etc.		0.3%
6	octopus	*Octopus dofleini*	0.3%
7	skate egg case	Family Rajidae	0.05%
8	hermit crab	Family Paguridae	0.03%
9	arrowtooth flounder	*Atheresthes stomias*	0.03%
10	snails	Class Gastropoda	0.02%
11	bristle worm	*Aphrodita negligens*	0.02%
12	Dover sole	*Microstomus pacificus*	0.02%
13	rex sole	*Glyptocephalus zachirus*	0.02%

Table 12. Twenty most frequently caught species by weight as recorded by scallop observers during the 1997/98 Kodiak Area, Northeast District scallop season.

Rank	Species	Scientific Name	% of Total Catch
1	weathervane scallops	*Patinopecten caurinus*	58.1%
2	starfish	Class Stelleroidea	20.8%
3	kelp, rocks, etc.		5.1%
4	weathervane shells	*P. caurinus*	4.3%
5	skates	Family Rajidae	3.0%
6	sea anemone	Order Actinaria	1.2%
7	arrowtooth flounder	*Atheresthes stomias*	1.1%
8	rock sole	*Lepidopsetta* spp.	0.8%
9	Dover sole	*Microstomus pacificus*	0.7%
10	octopus	*Octopus dofleini*	0.6%
11	Pacific halibut	*Hippoglossus stenolepis*	0.5%
12	sea pen	Order Pennatulacea	0.5%
13	sand dollar	*Echinarachnius parma*	0.4%
14	Pacific cod	*Gadus macrocephalus*	0.3%
15	hermit crab	Family Paguridae	0.2%
16	rex sole	*Glyptocephalus zachirus*	0.2%
17	snail shells	Class Gastropoda	0.1%
18	flathead sole	*Hippoglossaides elassodon*	0.1%
19	Tanner crab	*Chionoecetes bairdi*	0.1%
20	snails	Class Gastropoda	0.1%

Table 13. Twenty most frequently caught species by weight as recorded by scallop observers during the 1997/98 Kodiak Area, Shelikof District scallop season.

Rank	Species	Scientific Name	% of Total Catch
1	weathervane scallops	*Patinopecten caurinus*	77.8%
2	kelp, rock, etc.		7.1%
3	weathervane shells	*P. caurinus*	4.7%
4	skates	Family Rajidae	2.5%
5	starfish	Class Stelleroidea	2.3%
6	arrowtooth flounder	*Atheresthes stomias*	0.9%
7	flathead sole	*Hippoglossoides elassodon*	0.5%
8	Tanner crab	*Chionoecetes bairdi*	0.4%
9	Dover sole	*Microstomus pacificus*	0.3%
10	flatfish unidentified		0.3%
11	hermit crab	Family Paguridae	0.2%
12	sea anemone	Order Actinaria	0.2%
13	snails	Class Gastropoda	0.2%
14	Greenland turbot	*Reinhardtius hippoglossoides*	0.2%
15	hairy triton	*Fusitriton oregonensis*	0.2%
16	Alaska plaice	*Pleuronectes quadrituberculatus*	0.2%
17	lyre crab	*Hyas lyratus*	0.1%
18	snail eggs	Class Gastropoda	0.1%
19	skate egg case	Family Rajidae	0.1%
20	Pacific cod	*Gadus macrocephalus*	0.1%

Table 14. Twenty most frequently caught species by weight as recorded by scallop observers during the 1997/98 Kodiak Area, Semidi District scallop season.

Rank	Species	Scientific Name	% of Total Catch
1	kelp, rock, etc.		33.9%
2	starfish	Class Stelleroidea	21.5%
3	weathervane scallops	*Patinopecten caurinus*	21.1%
4	sea anemone	Order Actinaria	5.5%
5	weathervane shells	*P. caurinus*	3.0%
6	starry flounder	*Platichtys stellatus*	2.6%
7	Tanner crab	*Chionoecetes bairdi*	1.9%
8	skates	Family Rajidae	1.6%
9	flathead sole	*Hippoglossaides elassodon*	1.3%
10	man-made debris		1.1%
11	sculpin	Family Cottidae	0.9%
12	yellowfin sole	*Limanda aspera*	0.5%
13	octopus	*Octopus dofleini*	0.5%
14	rock sole	*Lepidopsetta spp.*	0.5%
15	Dungeness crab	*Cancer magister*	0.5%
16	butter sole	*Isopsetta isolepis*	0.4%
17	skate egg case	Family Rajidae	0.4%
18	sea pen	Order Pennatulacea	0.2%
19	clams	Class Bivalvia	0.2%
20	snail shells	Class Gastropoda	0.2%

Table 15. Twenty most frequently caught species by weight as recorded by scallop observers during the 1997/98 Alaska Peninsula Area scallop season.

Rank	Species	Scientific Name	% of Total Catch
1	weathervane scallops	*Patinopecten caurinus*	55.8%
2	starfish	Class Stelleroidea	24.3%
3	Kelp, rocks, etc,		4.4%
4	weathervane shells	*P. caurinus*	3.7%
5	arrowtooth flounder	*Atheresthes stomias*	2.2%
6	man-made debris		1.9%
7	flathead sole	*Hippoglossoides elassodon*	1.1%
8	rock sole	*Lepidopsetta* spp.	0.7%
9	Pacific halibut	*Hippoglossus stenolepis*	0.6%
10	bay scallops	*Chlamys* spp	0.5%
11	Pacific cod	*Gadus macrocephalus*	0.5%
12	sea urchin	Family Strongyocentrotidae	0.5%
13	skates	Family Rajidae	0.4%
14	sea pen	Order Pennatulacea	0.4%
15	hermit crab	Family Paguridae	0.3%
16	snails	Class Gastropoda	0.3%
17	Tanner crab	*Chionoecetes bairdi*	0.2%
18	octopus	*Octopus dofleini*	0.2%
19	sculpin	Family Cottidae	0.1%
20	hairy triton	*Fusitriton oregonensis*	0.1%

Table 16. Twenty most frequently caught species by weight as recorded by scallop observers during the 1997/98 Bering Sea Area scallop season.

Rank	Species	Scientific Name	% of Total Catch
1	weathervane scallops	*Patinopecten caurinus*	73.9%
2	snow crab	*Chionoecetes opilio*	5.7%
3	skates	Family Rajidae	4.3%
4	weathervane shells	*P. caurinus*	3.5%
5	arrowtooth flounder	*Atheresthes stomias*	2.9%
6	flathead sole	*Hippoglossoides elassodon*	1.1%
7	snails	Class Gastropoda	1.0%
8	Sea anemone	Order Actinaria	1.0%
9	Tanner crab	*Chionoecetes bairdi*	0.9%
10	Pacific cod	*Gadus macrocephalus*	0.8%
11	kelp, rock, etc		0.7%
12	hermit crab	Family Paguridae	0.6%
13	starfish	Class Stelleroidea	0.6%
14	Tanner hybrid	*Chionoecetes* spp.	0.6%
15	snail shells	Class Gastropoda	0.4%
16	man-made debris		0.4%
17	jellyfish	Class Scyphozoa	0.3%
18	Yellowfin sole	*Limanda aspera*	0.2%
19	sculpin	Family Cottidae	0.2%
20	lyre crab	*Hyas lyratus*	0.1%

Table 17. Twenty most frequently caught species by weight as recorded by scallop observers during the 1997/98 Dutch Harbor Area scallop season.

Rank	Species	Scientific Name	% of Total Catch
1	kelp, rock, etc.		50.3%
2	weathervane scallops	*Patinopecten caurinus*	35.6%
3	rock sole	*Lepidopsetta bilineata*	4.9%
4	starfish	*Class Stelleroidea*	2.6%
5	weathervane shells	*P. caurinus*	2.3%
6	sea urchin	Family Strongyocentrotidae	0.7%
7	snails	Class Gastropoda	0.5%
8	Tanner crab	*Chionoecetes bairdi*	0.4%
9	Pacific cod	*Gadus macrocephalus*	0.3%
10	sculpin	Family Cottidae	0.3%
11	skates	Family Rajidae	0.3%
12	Pacific halibut	*Hippoglossus stenolepis*	0.2%
13	bay scallops	*Chlamys* spp	0.2%
14	sea pen	Order Pennatulacea	0.2%
15	lyre crab	*Hyas lyratus*	0.2%
16	hermit crab	Family Paguridae	0.2%
17	rex sole	*Glyptocephalus zachirus*	0.1%
18	sponge	Phylum Porifera	0.1%
19	snail shells	Class Gastropoda	0.1%
20	sea anemone	Order Actinaria	0.09%

Table 18. Estimated bycatch, in numbers of individuals, and confidence intervals for *C. opilio, C. bairdi*, Dungeness, and king crab, and Pacific halibut from the 1997/98 statewide scallop fishery.

Management Area	n[a]	Bycatch Estimates by Species									
		C. opilio		*C. bairdi*		Dungeness		King crab		Pacific Halibut	
		Bycatch	95% CI	Bycatch	95% CI	Bycatch	95% CI	Bycatch[b]	95% CI	Bycatch	95% CI
Yakutat	144	0	NA	5,884	4,084-8,272	277	168-438	0	NA	353	249-453
District 16	27	0	NA	129	71-295	0	NA	0	NA	160	107-202
Prince William Sound	8	0	NA	0	NA	0	NA	0	NA	8	NA
Kodiak											
Northeast District	95	0	NA	11,914	9,879-14,082	0	NA	0	NA	665	549-804
Shelikof District	153	0	NA	36,744	34,566-39,020	4,359	3,046-5,853	0	NA	440	320-566
Semidi District	14	0	NA	8,500	5,620-11,663	856	561-1,165	1	NA	16	0-35
Alaska Peninsula	68	0	NA	21,971	20,217-24,160	0	NA	0	NA	347	274-429
Bering Sea	66	182,517[c]	151,696-227,263	28,446	26,214-31,219	0	NA	0	NA	98	59-141
Dutch Harbor	8	0	NA	12,582	10,192-14,929	0	NA	1	NA	22	0-44

[a]Number of days fishing occurred.
[b]Actual count, not an estimate.
[c]An additional estimated 12,828 hybrids were taken as bycatch.
NA = Not Applicable

Table 19. *Chionoecetes* crab bycatch mortality as recorded by scallop observers during the 1997/98 fishing season.

	NUMBER OF *CHIONOECETES* CRABS OBSERVED		
MANAGEMENT AREA	Dead	Alive	Percent Dead
District 16	11	6	65
Yakutat	247	533	32
Yakutat Mgmt Area Combined	258	539	32
Prince William Sound	0	0	0
Kodiak, Northeast District	624	1,596	28
Kodiak, Shelikof District	1,174	4,135	22
Kodiak, Semidi District	389	520	43
Kodiak Mgmt Area Combined	2,187	6,251	26
Alaska Peninsula	726	2,698	21
Bering Sea *C.opilio* /hybrid	6,304	5,219	55
Bering Sea *C.bairdi*	726	1,094	40
Bering Sea, Combined Species	7,030	6,313	53
Dutch Harbor	391	500	44
All areas Combined	10,592	16,301	39

Table 20. Number and condition of Pacific halibut as recorded by scallop observers during the 1997/98 fishing season.

	CONDITION OF PACIFIC HALIBUT[a] (Number of Halibut)						
MANAGEMENT AREA	Excellent	Good	Fair	Poor	Dead	Previously dead	Total
District 16	8	3	2	1	1	0	15
Yakutat	14	6	7	13	0	1	41
Prince Wiliam Sound	0	0	1	0	1	0	2
Kodiak, Northeast District	16	18	8	6	23	16	87
Kodiak, Shelikof District	23	15	6	5	2	0	51
Kodiak, Semidi District	3	0	0	0	0	0	3
Alaska Peninsula	17	14	4	4	10	0	49
Bering Sea	5	3	0	0	1	0	9
Dutch Harbor	1	0	0	0	1	0	2
Total all Areas	**87**	**59**	**28**	**29**	**39**	**17**	**259**

[a]Condition Codes:

Excellent: Vigorous body movement before and after release; could close operculum tightly; minor external injuries, if any.
Good: Feeble body movements; could close operculum tightly; minor external injuries, if any.
Fair: No body movement; could close operculum tightly; minor external injuries, if any.
Poor: No body movement; could move operculum but not tightly; severe injuries (eg. bleeding).
Dead: No body or opercular movement; probably killed in sampled haul.
Previously dead: Obviously not killed in the current haul (incidentally caught).

Table 21. Summary of commercial fishery statistics and scallop observer data from the 1997/98 scallop fishery.

Management Area	Season Dates	Number of Vessels[a]	Number of Days Fishing Observed[b]	Pounds[c] of Retained Scallops (Round Weight)	Pounds of Retained Scallops (Shucked Meats)	Dredge Hours[d]	CPUE[e]	Estimated Bycatch		% Scallops (by weight) in Samples[f]	Number of Tanners per Pound of Retained Scallop Meats
								Tanner	Halibut		
District 16	16 Jan-23 Feb	4	20	265,882	22,020	561	474	129	160	73	<0.01
Yakutat	10 Jan-18 Feb	4	129	3,282,860	243,810	3,956	830	5,884	353	81	0.02
Prince William Sound	10 Jan-19 Jan	1	7	257,230	18,000	171	1,504	0	8	97	0
Kodiak											
Northeast District	1 Jul-19 Nov	4	86	1,143,926	95,858	2,603	439	11,914	665	58	0.12
Shelikof District	1 Jul-10 Aug	4	150	3,101,153	258,346	5,490	565	36,744	440	78	0.14
Semidi District	1 Jul 97-15 Feb 98	1	14	61,320	6,315	349	176	8,500	16	21	1.35
Kodiak Combined	1 Jul 97-15 Feb 98	5	250	4,306,399	360,519	8,442	510	57,158	1,121	71	0.16
Alaska Peninsula	1 Jul 97-15 Feb 98	4	64	654,960	51,616	1,752	374	21,971	347	56	0.42
Bering Sea	1 Jul-11 Aug	2	64	1,082,825	97,002	2,246	482	223,791[g]	98	74	2.31
Dutch Harbor	1 Jul-25 Aug	1	8	55,725	5,790	171	326	12,582	22	36	2.17
Statewide Combined (excluding Cook Inlet)	not applicable	6	792	9,905,881	780,757	25,570	387	378,673	3,230	73	0.49

[a]Vessel operators voluntarily released their confidential data.

[b]An observed day is a day with at least one sampled tow.

[c]Vessel operator estimates.

[d]Dredge hour = one dredge towed for 60 minutes.

[e]CPUE = pounds (round weight) of retained scallops per dredge-hour.

[f]From haul composition samples only, not estimated.

[g]Includes 28,446 *C. bairdi* and 195,345 *C. opilio* /hybrids.

Table 22. Summary of weathervane scallop commercial fishery statistics and observer data from District 16, Yakutat, and Prince William Sound Areas, 1993-1997.

Management Area	Season Dates		Number of Vessels	Number of Vessel Days[a]	Number of Days Fishing Occurred[b]	Number of Days Fishing Observed[c]	Crab Bycatch Limits		Bycatch Estimates				Tanner Crab Mortality %
	Beginning	Ending					Tanner	King Crab	Tanner	King[d]	Dungeness	Halibut	
District 16													
1993	Fishing by Permit Only		1	a	i	i	NE	NE	i	i	i	i	i
1994	20-Jan-94	20-Jan-94	7	a	7	7	NE	NE	10	0	4	48	67
1994	01-Jul-94	31-Oct-94	1	a	4	3	NE	NE	0	0	11	236	0
1995	10-Jan-95	13-Feb-95	6	a	42	35	NE	NE	469	0	93	719	28
1996	10-Jan-96	20-Jan-96	1	a	6	5	NE	NE	39	0	140	108	0
1996	01-Aug-96	29-Nov-96	2	a	23	21	NE	NE	669	0	1	68	47
1997	10-Jan-97	23-Feb-97	4	a	27	20	NE	NE	129	0	0	160	65
Yakutat													
1993	01-Jul-93	11-Jul-93	7	96	77	75	NE	NE	1,700	40	351	99	54
1994	10-Jan-94	18-Jan-94	10	119	88	83	NE	NE	1,767	0	10	129	31
1994	01-Jul-94	12-Jul-94	5	82	60	60	NE	NE	603	0	169	522	56
1995	10-Jan-95	02-Feb-95[e]	8	235	166	134	NE	NE	3,751	0	2,379	1,361	26
1996	10-Jan-96	25-Jan-96	3	54	47	43	NE	NE	2,591	0	2,320	237	27
1996	01-Aug-96	04-Sep-96	3	116	82	80	NE	NE	6,872	0	38	150	59
1997	10-Jan-97	18-Feb-97	4	172	144	129	NE	NE	5,884	0	277	353	32
Prince William Sound													
1993	15-Jul-93	18-Jul-93	7	58	29	27	500	NE	200	0	0	27	58
1994	Seaon Closed												
1995	10-Jan-95	26-Jan-95	2	29	21	21	500	NE	271	0	0	153	0
1996	Season Closed												
1997	10-Jan-97	19-Jan-97	1	12	8	7	500	NE	0	0	0	8	0

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Table 22. (page 2 of 2)

Management Area	Pounds of Retained Scallops (round weight)[f]	Pounds of Retained Scallops (shucked meats)	% Adductor Muscle Recovery	Dredge Hours[g]	CPUE[h]	% of Scallops In Catch (by weight)	Est. Number Of Discarded Scallops	Est. Weight Of Discarded Scallops	Retained Scallops Avg. Shell Height(mm)	Retained Scallops Sample Size	No. of Tanner Crab Per lb. of retained Scallop Meats
District 16											
1993	confidential[i]										
1994	150,962	13,301	NA	276	547	72	NA	NA	147	196	<0.1
1994	i	i	NA	i	i	55	NA	NA	151	218	0
1995	447,469	33,302	NA	1,095	409	65	NA	NA	132	2,347	<0.1
1996	i	i	NA	i	i	92	NA	NA	126	430	h
1996	336,978	25,970	9.0	750	449	81	707,236	159,899	133	1,821	<0.1
1997	265,882	22,020	9.9	561	474	73	143,392	32,764	128	1,020	<0.1
Yakutat											
1993	2,082,824	141,423	NA	1,999	1,042	78	NA	NA	118	5,651	<0.1
1994	2,085,942	158,660	NA	2,547	819	78	NA	NA	121	2,488	<0.1
1994	1,713,094	94,400	NA	1,715	999	81	NA	NA	122	4,903	<0.1
1995	3,214,968	242,491	NA	4,712	682	78	NA	NA	124	10,824	<0.1
1996	908,842	53,310	NA	1,765	515	82	NA	NA	121	4,310	<0.1
1996	2,362,498	185,426	9.0	2,840	832	85	1,166,422	295,933	122	8,253	<0.1
1997	3,282,860	243,810	9.0	3,956	830	81	2,786,453	745,801	119	7,790	<0.1
Prince William Sound											
1993	850,718	63,068	NA	638	1,333	90	NA	NA	124	1,628	<0.1
1994	Season Closed										
1995	Confidential	108,000[j]	NA	Confidential		98	NA	NA	125	1,010	NA
1996	Season Closed										
1997	257,230	18,000	9.6	171	1,504	97	NA	NA	123	743	0

[a]All days between observer briefing and debriefing, District 16 vessel days included with Yakutat vessel days.

[b]All days with at least one tow made by the vessel.

[c]All days with at least one sampled tow.

[d]Actual count, not an estimated, beginning with the 1995/96 season.

[e]Reopened February 13 (12 Noon) to February 14 (12 Noon).

[f]Vessel operator estimates.

[g]Dredge-hour = one dredge towed for 60 minutes

[h]CPUE = round weight of retained scallops per dredge-hour.

[i]Confidential, included in Yakutat data.

[j]Includes estimated illegal harvest.

NA=Not Applicable, NE=Not Established

Table 23. Summary of weathervane scallop commercial fishery statistics and observer data from the Kodiak Area, 1993-1997.

Management Area	Season Dates		Number of Vessels	Number of Vessel Days[a]	Number of Days Fishing Occurred[b]	Number of Days Fishing Observed[c]	Crab Bycatch Limits		Bycatch Estimates				Tanner Crab Mortality %
	Beginning	Ending					Tanner	King Crab	Tanner	King[d]	Dungeness	Halibut	
Kodiak													
Northeast District													
1993/94	01-Jul-93	24-Nov-93	10	e	272	237	e	e	33,511	9	5	1,513	23
1994/95	01-Jul-94	15-Feb-95	7	e	77	68	143,000	123	2,054	190	0	577	34
1995/96	Season Closed												
1996/97	01-Aug-96	15-Feb-97	3	e	29	19	130,000	66	27,722	0	0	202	16
1997/98	01-Jul-97	19-Nov-97	4	e	95	86	91,600	50	11,914	0	0	58	28
Shelikof District													
1993/94	01-Jul-93	05-Aug-93	5	e	83	79	e	e	51,560	0	122	226	13
1994/95	01-Jul-94	01-Oct-94	11	e	263	257	98,000	219	64,444	29	1,097	851	14
1995/96	Season Closed												
1996/97	01-Aug-96	18-Oct-96	4	e	104	99	16,100	22	11,285	0	515	440	37
1997/98	01-Jul-97	10-Aug-97	4	e	153	150	51,000	35	36,744	0	4,359	78	22
Semidi District													
1993/94	01-Jul-93	11-Feb-94	7	e	75	70	Not Established		62,726	29	12,905	136	21
1994/95	01-Jul-94	15-Feb-95	2	e	10	10	Not Established		984	22	64	21	28
1995/96	Season Closed												
1996/97	01-Aug-96	15-Feb-97	3	e	37	32	Not Established		8,902	9	0	79	37
1997/98	10-Jul-97	15-Feb-98	1	e	14	14	Not Established		8,500	1	856	21	43
Kodiak Area Combined													
1993/94	01-Jul-93	11-Feb-94	10	597	430	386	199,500	283	147,797	38	13,032	1,875	18
1994/95	01-Jul-94	15-Feb-95	10	474	350	333	241,000	342	67,482	241	1,161	1,449	15
1995/96	Season Closed												
1996/97	01-Jul-96	15-Feb-97	5	237	170	150	146,100	88	47,909	9	515	721	28
1997/98	01-Jul-97	15-Feb-98	5	335	262	250	142,600	85	57,158	1	5,215	157	26

Continued

Table 23. (page 2 of 2)

Management Area	Pounds of Retained Scallops (round weight)[f]	Pounds of Retained Scallops (shucked meats)	% Adductor Muscle Recovery	Dredge Hours[g]	CPUE[h]	% Scallops In Catch (by weight)	Est. Number Of Discarded Scallops	Est. Weight Of Discarded Scallops	Retained Scallops Avg. Shell Height(mm)	Retained Scallops Sample Size	No. of Tanner Crab Per lb. of Retained Scallop Meats
Kodiak											
Northeast District											
1993/94	2,214,427	155,187	NA	6,940	319	46	NA	NA	144	12,221	0.2
1994/95	389,202	35,517	NA	1,773	220	44	NA	NA	151	4,171	<0.1
1995/96	Season closed										
1996/97	147,269	11,430	10.0	581	253	54	22,076	8,355	144	1,252	2.4
1997/98	1,143,926	95,858	10.1	2,603	439	58	532,140	115,156	140	7,300	0.1
Shelikof District											
1993/94	1,169,664	105,017	NA	2,504	467	71	NA	NA	128	6,599	0.5
1994/95	3,522,517	320,111	NA	8,720	404	64	NA	NA	131	20,426	0.2
1995/96	Season Closed										
1996/97	1,878,268	219,305	12.0	3,497	537	77	753,292	197,174	136	10,615	<0.1
1997/98	3,101,152	258,346	9.4	5,490	565	78	1,189,903	262,847	139	16,378	0.1
Semidi District											
1993/94	579,836	58,157	NA	1,819	319	38	NA	NA	145	3,713	1.1
1994/95	i	i	i	i	i	49	NA	NA	153	767	i
1995/96	Season Closed										
1996/97	288,117	37,810	12.0	1,017	283	52	11,211	6,000	154	2,529	0.2
1997/98	61,320	6,315	11.4	349	176	21	5,831	2,716	147	1,066	1.3
Kodiak Area Combined											
1993/94	3,963,927	318,361	NA	11,236	353	50	NA	NA	143	22,533	0.5
1994/95	3,911,719	354,498	NA	10,765	363	60	NA	NA	135	25,364	0.2
1995/96	Season closed										
1996/97	2,313,654	268,545		5,095	454	71	786,579	211,529	139	14,396	0.2
1997/98	4,306,399	360,519	9.4	8,442	510	73	1,727,874	308,719	139	24,744	0.2

[a]All days between observer briefing and debriefing.

[b]All days with at least one tow made by the vessel.

[c]All days with at least one sampled tow.

[d]Actual count, not an estimate, beginning with the 1995/96 season.

[e]Included in Kodiak Area combined.

[f]Vessel operator estimates.

[g]Dredge hour = one dredge towed for 60 minutes

[h]CPUE = round weight of retained scallops per dredge-hour.

[i]Confidential, combined with Shelikof.

NA=Not Applicable NS=Not summarized

Table 24. Summary of weathervane scallop commercial fishery statistics and observer data from the Alaska Peninsula, Bering Sea, Dutch Harbor, and Adak Areas, 1993-1997.

Management	Season Dates		Number of	Number of Vessel	Number of Days Fishing	Number of Days Fishing	Crab Bycatch Limits			Bycatch Estimates					Tanner Crab
Area	Beginning	Ending	Vessels	Days[a]	Occurred[b]	Observed[c]	*C. opilio*	*C. bairdi*	King	*C. opilio*[d]	*C. bairdi*	King[e]	Dungeness	Halibut	Mortality %
Alaska Peninsula															
1993/94	01-Jul-93	21-Oct-93	8	136	75	69	NA	52,530	85	NA	180,319	25	0	329	35
1994/95	01-Jul-95	22-Sep-95	7	137	80	70	NA	44,000	119	NA	25,287	0	73	157	29
1995/96	SEASON CLOSED														
1996/97	01-Aug-96	31-Oct-96	2	34	13	12	NA	22,000	435	NA	19,045	0	4	25	32
1997/98	01-Jul-97	15-Feb-98	4	100	68	64	NA	45,300	79	NA	21,971	0	0	347	21
Bering Sea															
1993/94	01-Jul-93	05-Sep-93	9	275	174	168	NA	260,000	17,000	15,000	290,913	207	0	165	12
1994/95	01-Jul-94	07-Sep-94	8	382	312	309	NA	260,000	17,000	34,867	220,710	22	0	3,513	24
1995/96	SEASON CLOSED														
1996/97	01-Aug-96	15-Feb-97	1	79	63	54	275,000	257,000	500	106,935	16,642	0	0	124	16
1997/98	01-Jul-97	11-Aug-97	2	81	66	64	172,000	238,000	500	195,345	28,446	0	0	98	53
Dutch Harbor															
1993/94	01-Jul-93	18-Sep-93	3	46	36	24	NA	50,500	45	NA	69,354	35	0	270	50
1994/95	01-Jul-94	15-Feb-95	3	21	6	6	NA	87,000	47	NA	757	7	0	0	54
1995/96	01-Jul-95	15-Feb-96	1	62	38	35	NA	NA	NA	Confidential					22
1996/97	01-Aug-96	15-Feb-97	No Fishing Effort												
1997/98	01-Jul-97	25-Aug-97	1	15	8	8	NA	10,700	10	NA	12,582	1	0	22	44
Adak															
1993/94	Not established as a separate area, included with Bering Sea Area.														
1994/95	01-Jul-94	15-Feb-95	No Fishing Effort				NA	NA	NA						
1995/96	01-Jul-95	15-Feb-96	1	7	4	4	NA	NA	NA	Confidential					
1996/97	01-Aug-96	15-Feb-97	No Fishing Effort				NA	10,000	50						
1997/98	01-Jul-97	15-Feb-98	No Fishing Effort				NA	10,000	50						

Continued

Table 24. (page 2 of 2)

Management Area	Pounds of Retained Scallops (round weight)[f]	Pounds of Retained Scallops (shucked meats)	% Adductor Muscle Recovery	Dredge Hours[g]	CPUE[h]	% Scallops In Catch (by weight)	Est. Number Of Discarded Scallops	Est. Weight Of Discarded Scallops	Retained Scallops		No. of Tanner Crab Per lb of Retained Scallop Meats
									Avg. Shell Height (mm)	Sample Size	
Alaska Peninsula											
1993/94	1,061,925	112,087	NA	1,847	575	75	NA	NA	119	5,183	1.3
1994/95	619,473	65,282	NA	1,664	372	73	NA	NA	127	4,069	0.4
1995/96	Season Closed										
1996/97	130,235	12,560	11.0	327	398	70	33,684	7,384	126	769	1.5
1997/98	654,960	51,616	8.7	1,752	374	56	163,494	38,219	135	5,604	0.4
Bering Sea											
1993/94	3,447,681	284,414	NA	5,763	598	NS	NA	NA	146	12,169	1.0
1994/95	5,942,912	505,439	NA	11,113	535	77	NA	NA	147	26,451	0.5
1995/96	Season Closed										
1996/97	1,432,160	150,295	10.0	2,313	619	88	34,412	16,188	147	4,039	0.8
1997/98	1,082,825	97,002	8.8	2,246	482	74	114,614	38,262	151	4,726	2.3
Dutch Harbor											
1993/94	432,970	38,731	NA	838	517	NS	NA	NA	128	1,948	1.3
1994/95	23,590	1,931	NA	81	291	56	NA	NA	158	105	0.4
1995/96	Confidential								134	3,026	
1996/97	No Fishing effort										
1997/98	55,725	5,790	10.6	171	326	36	67,742	18,561	127	267	2.2
Adak											
1993/94	Not established as a separate area.										
1994/95	No Fishing effort										
1995/96	Confidential										
1996/97	No Fishing effort										
1997/98	No Fishing effort										

[a]All days between observer briefing and debriefing.
[b]All days with at least one tow made by the vessel.
[c]All days with at least one sampled tow.
[d]*C. Opilio* and hybrids combined.
[e]Actual count, not an estimate, beginning with the 1995/96 season.
[f]Vessel operator estimates.
[g]Dredge-hour = one dredge towed for 60 minutes.
[h]CPUE = round weight of retained scallops per dredge-hour.

NA=Not applicable
NS=Not Summarized

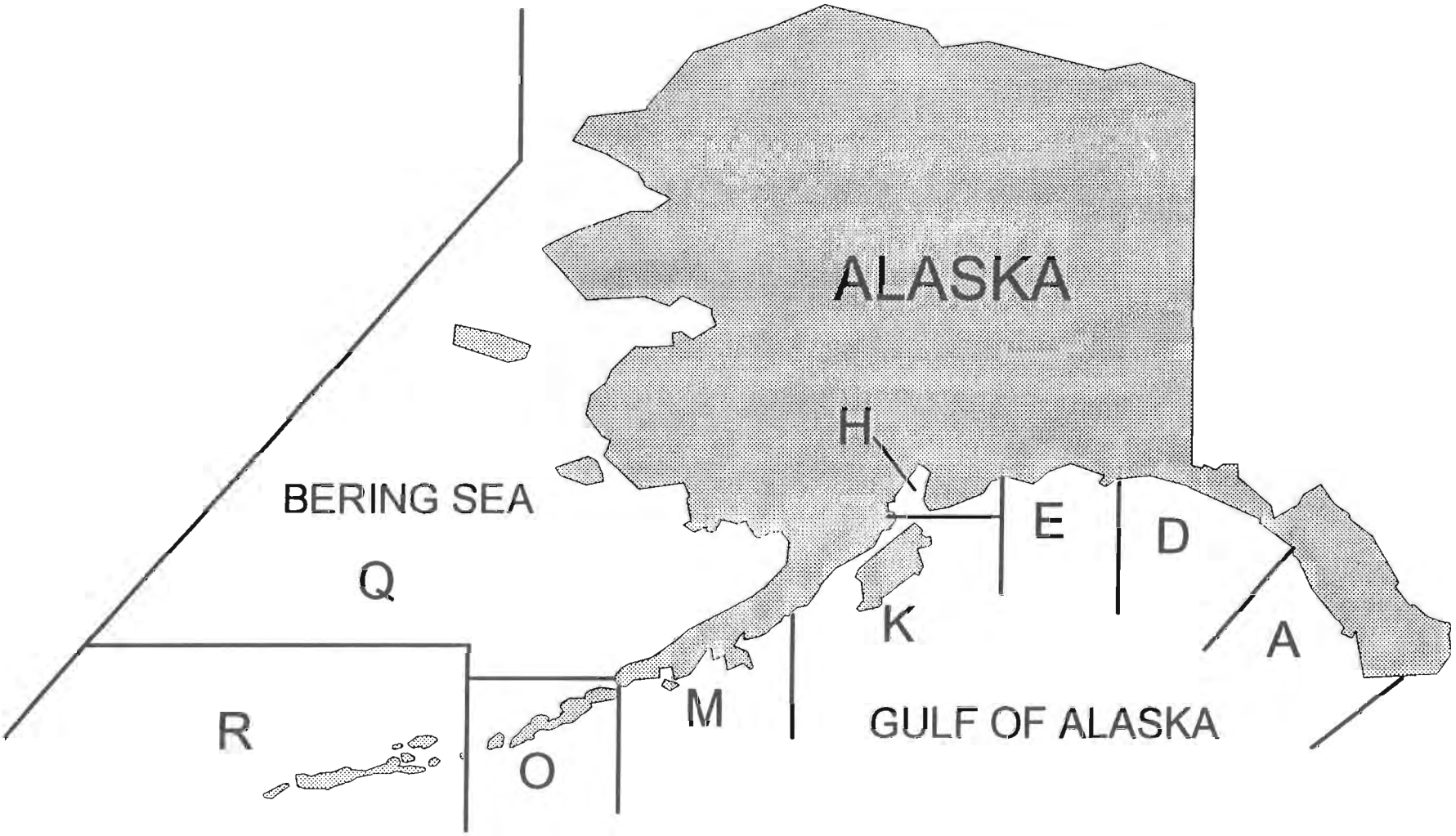

Figure 1. State of Alaska Scallop Fishing Registration Areas.

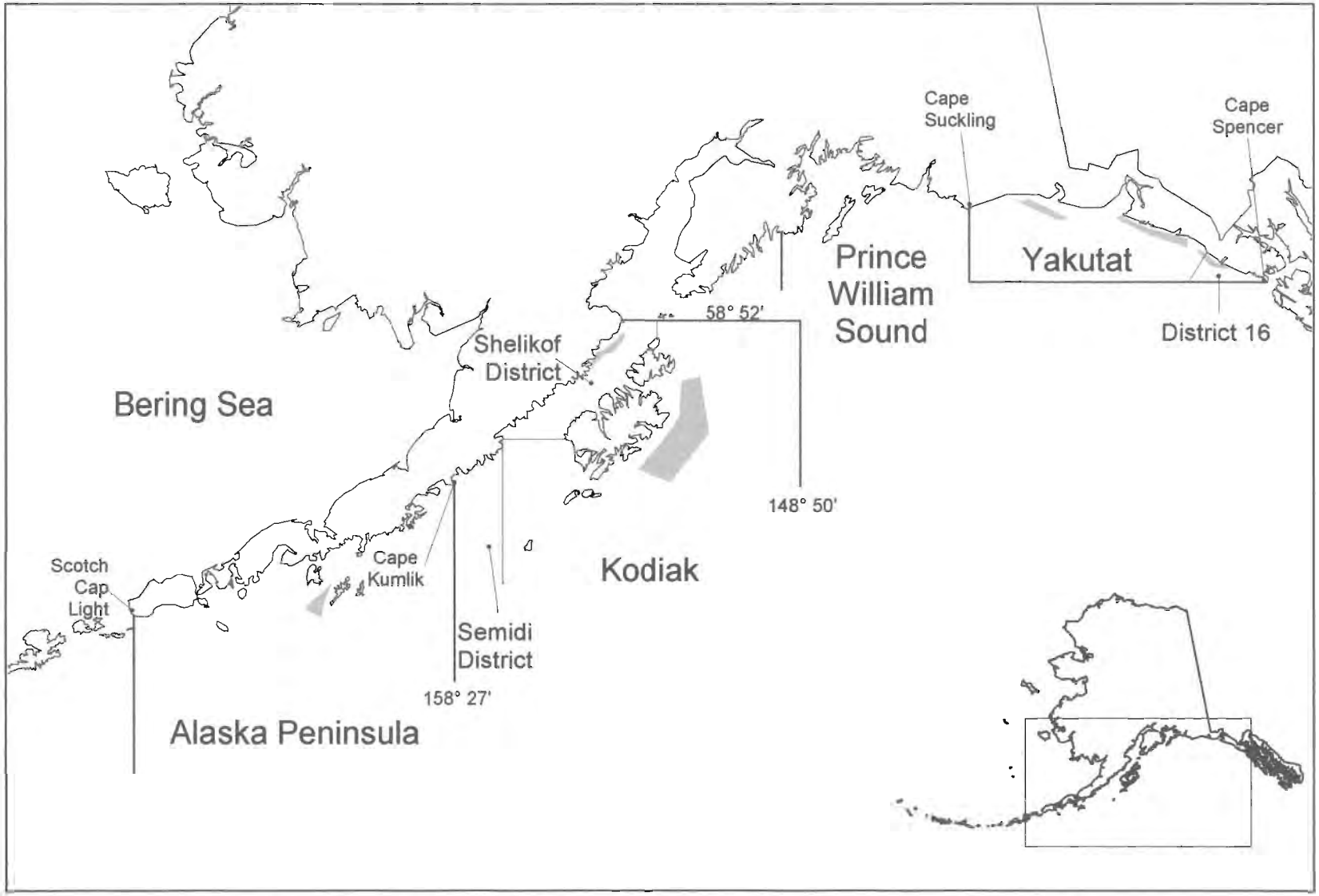

Figure 2. Major fishing locations during the 1997/98 scallop fishery in the District 16, Yakutat, Kodiak, and Alaska Peninsula Areas.

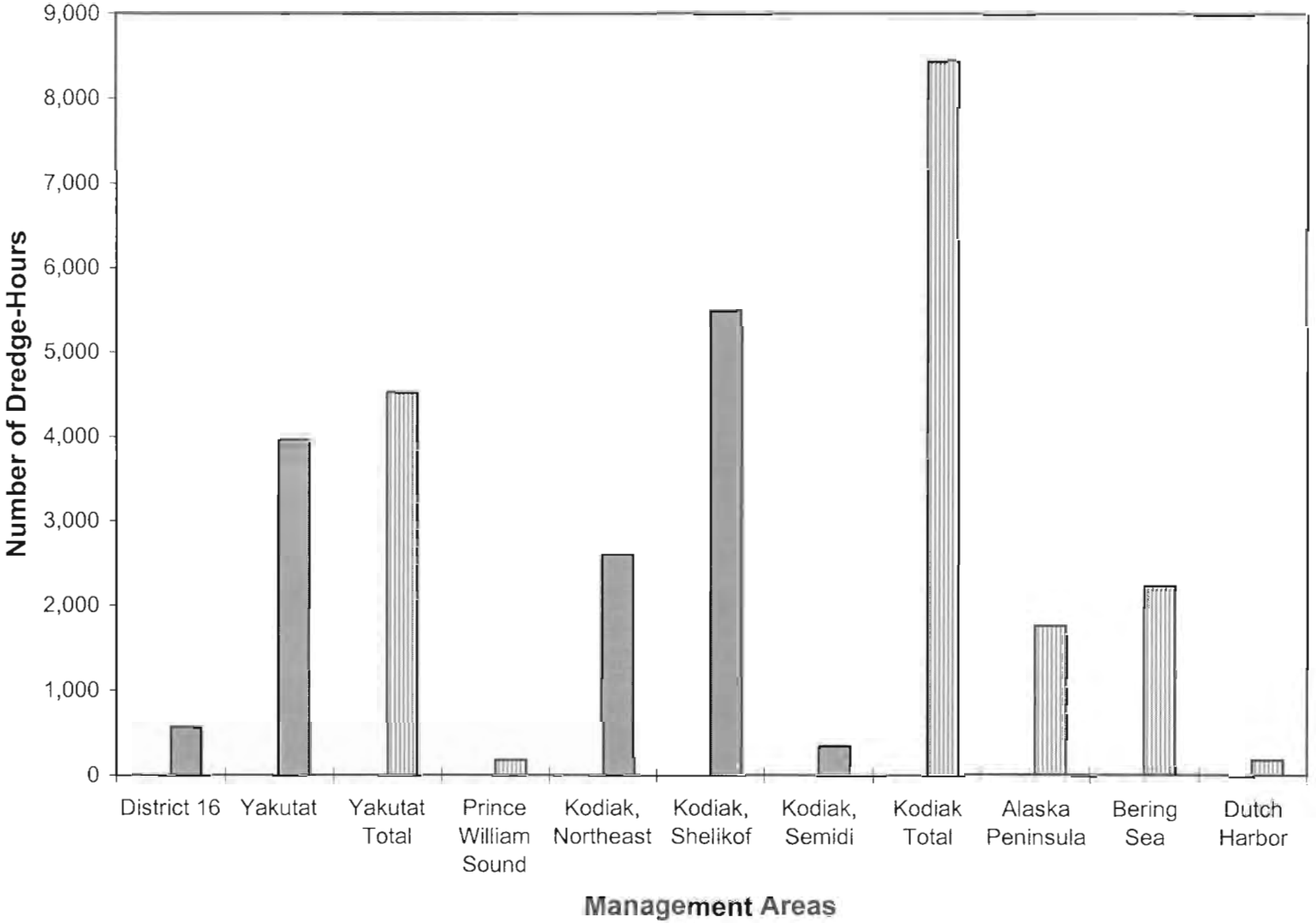

Figure 3. Fishing effort in dredge-hours by management area in the 1997/98 scallop fishery.

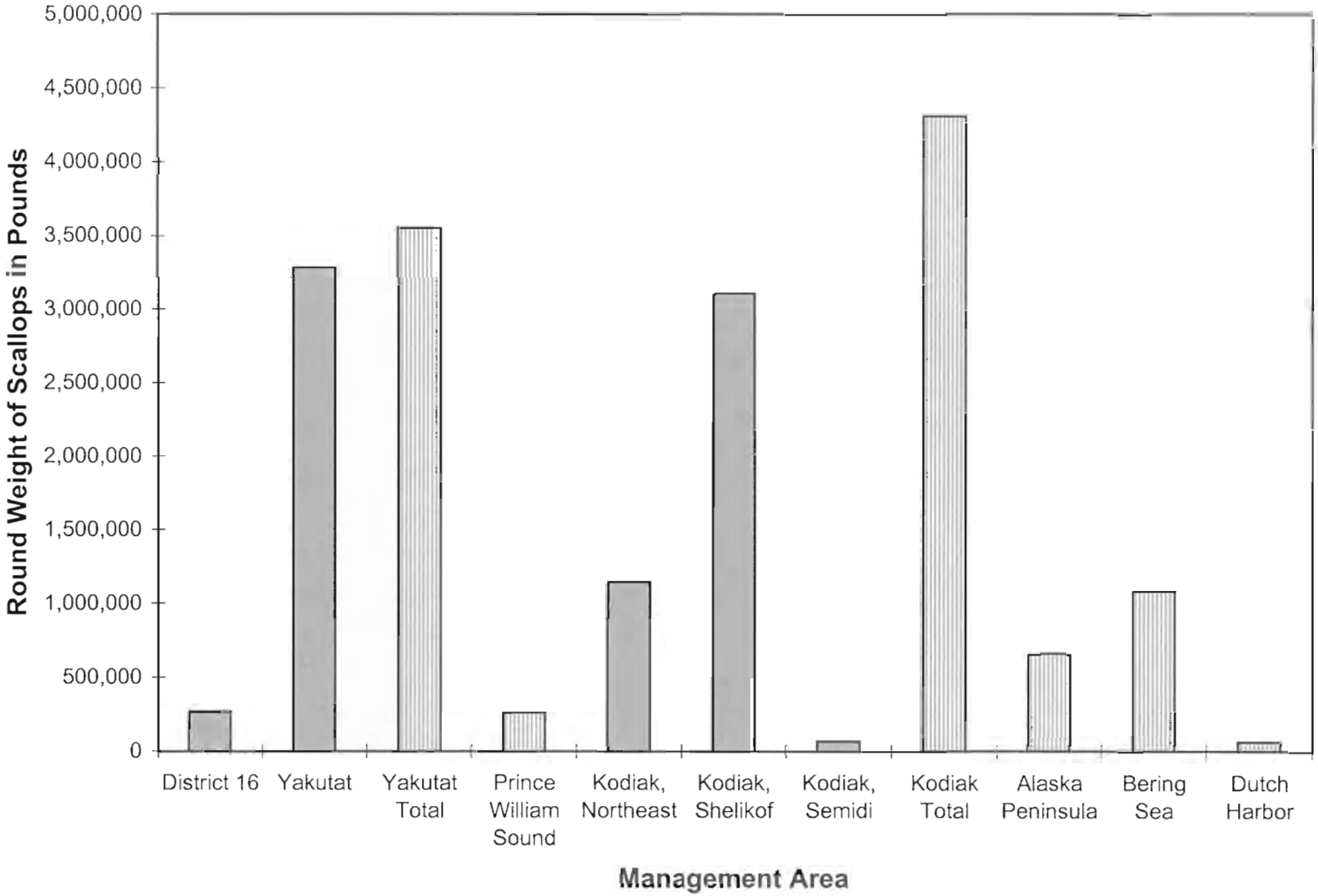

Figure 4. Round weight in pounds of retained scallops by management area in the 1997/98 scallop fishery.

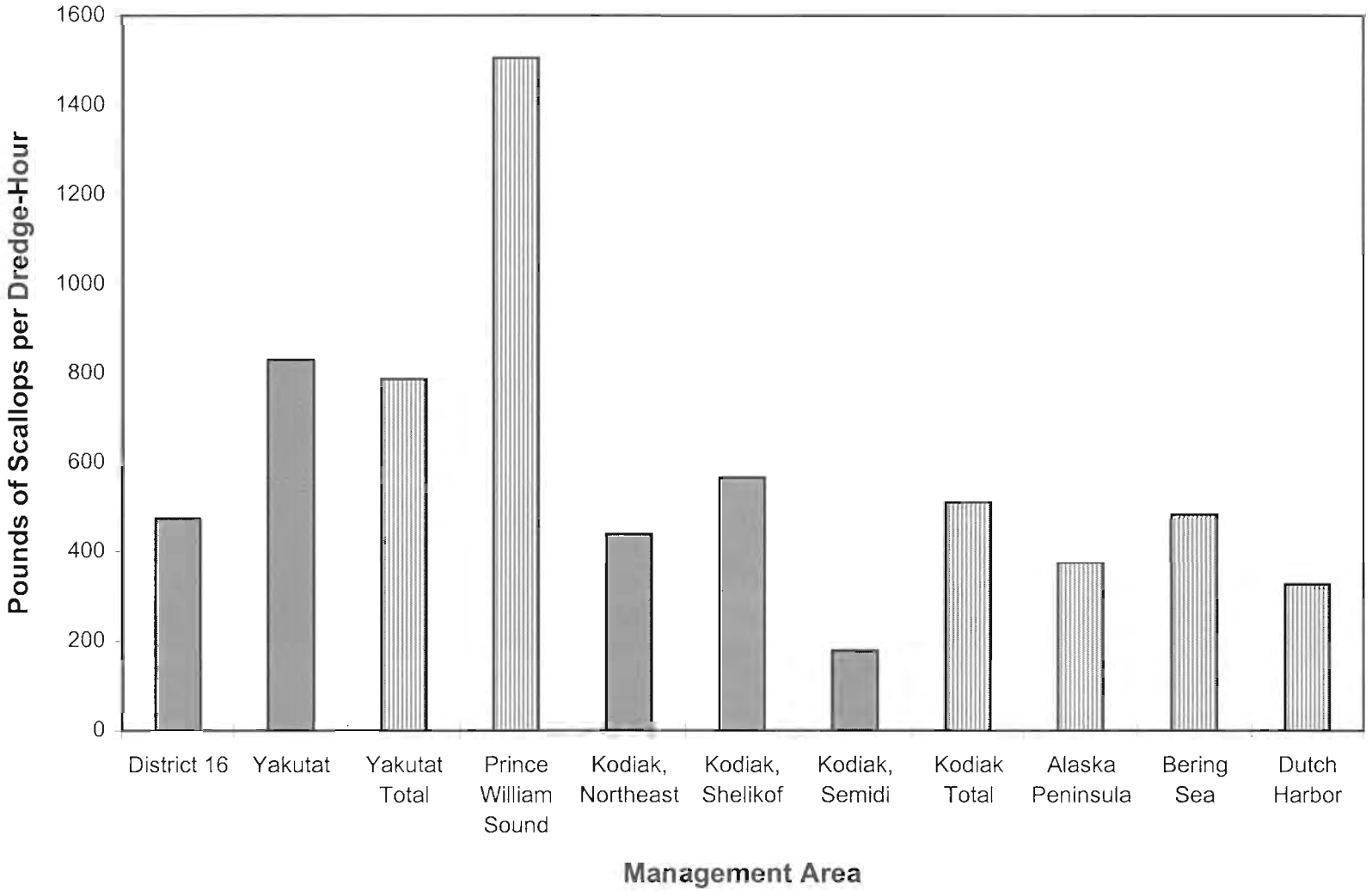

Figure 5. Round weight of retained scallops per dredge-hour by management area in the 1997/98 scallop fishery.

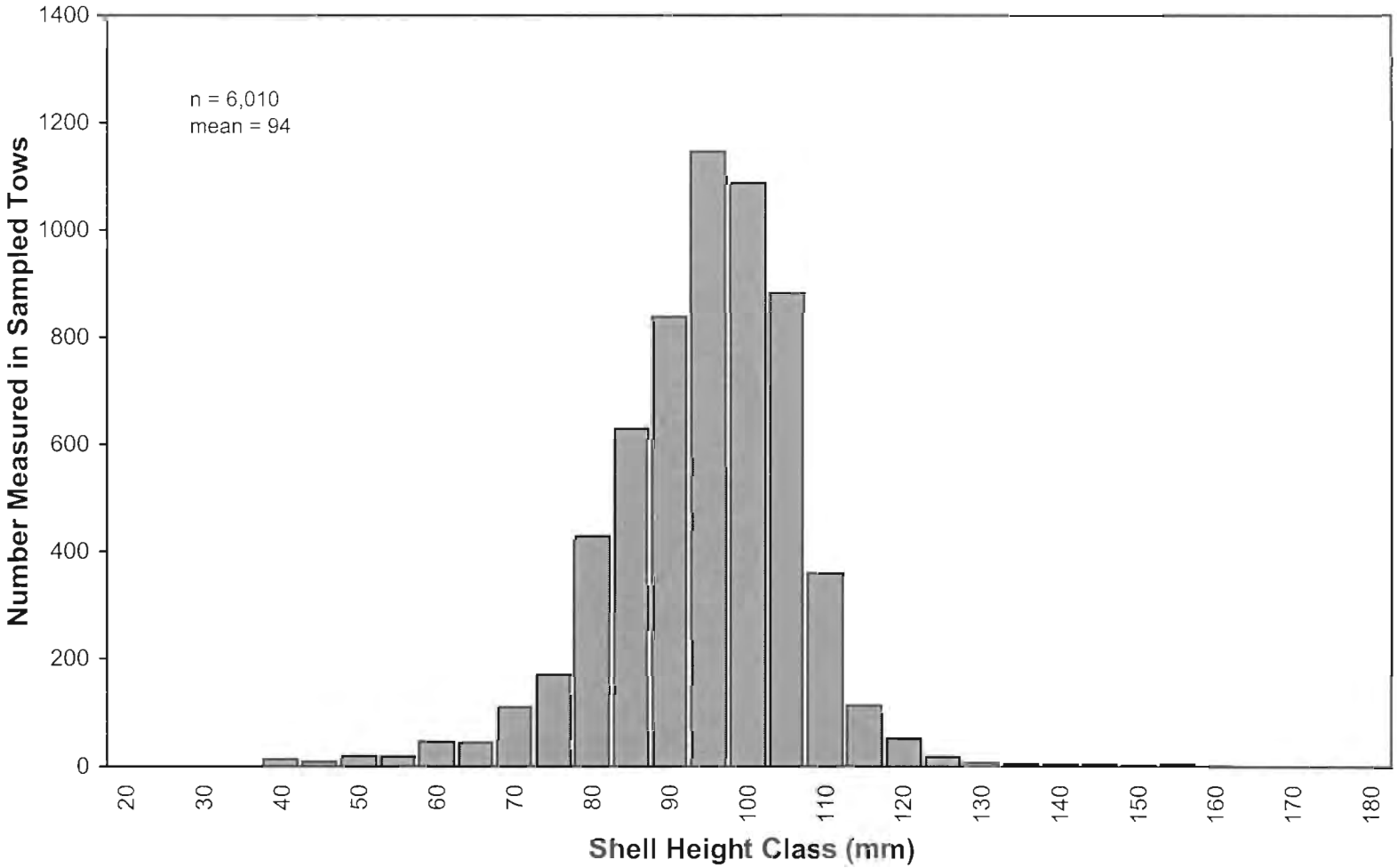

Figure 6. Shell height distribution of intact discarded scallops from observer samples, District 16, 1997.

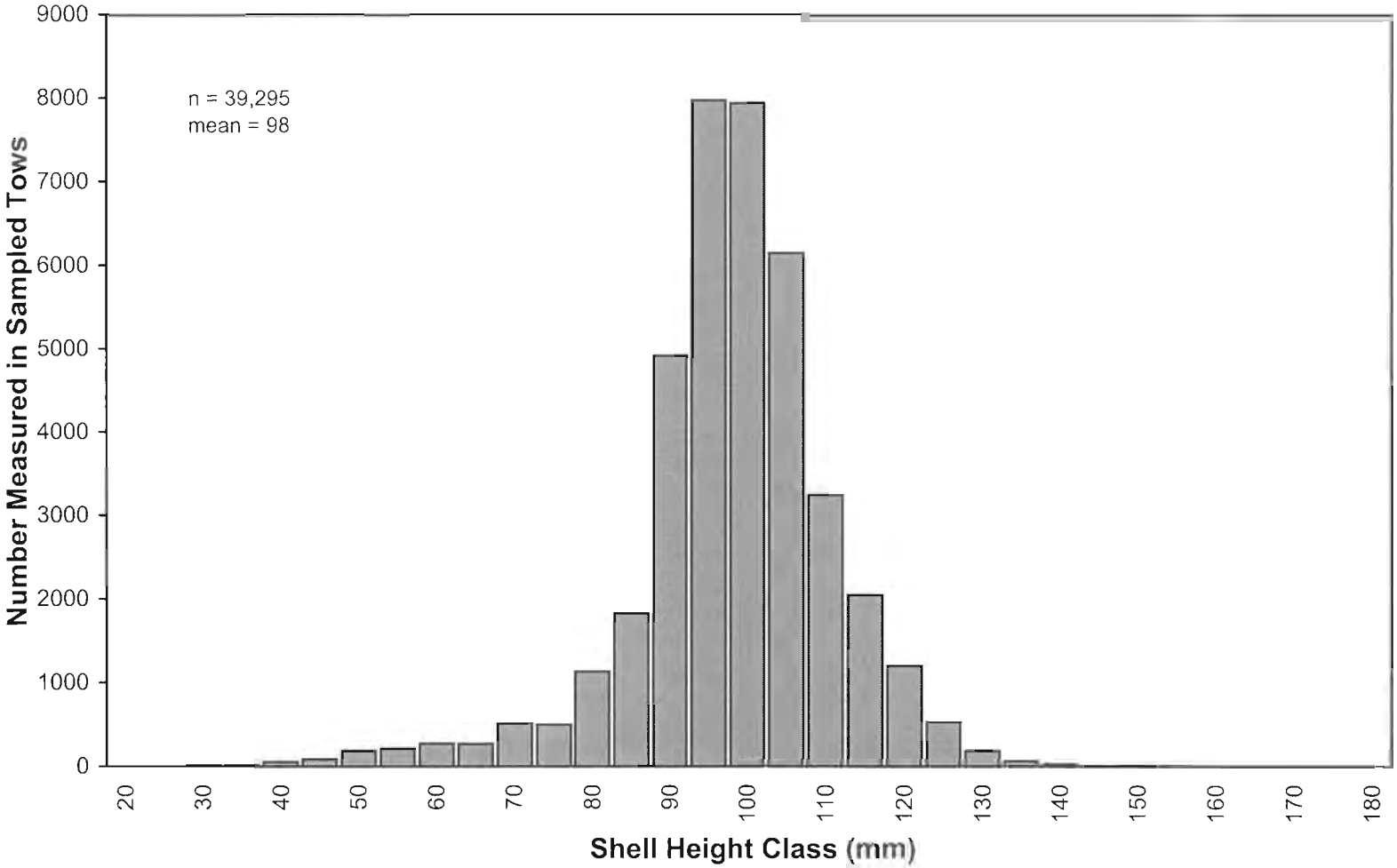

Figure 7. Shell height distribution of intact discarded scallops from observer samples, Yakutat Area, 1997.

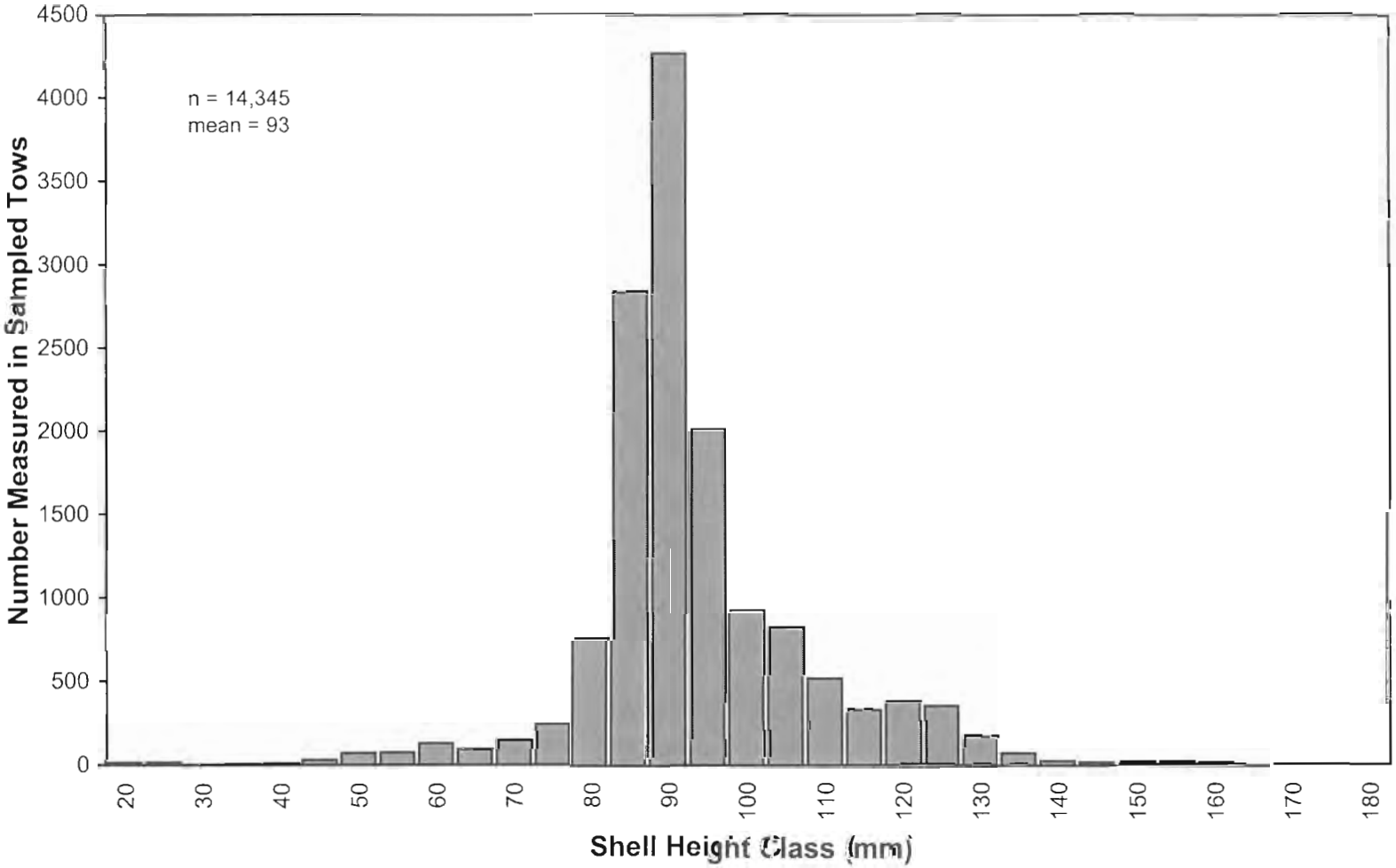

Figure 8. Shell height distribut on of intact discarded scallops from observer samples, Northeast District, Kodiak Area, 1997/98.

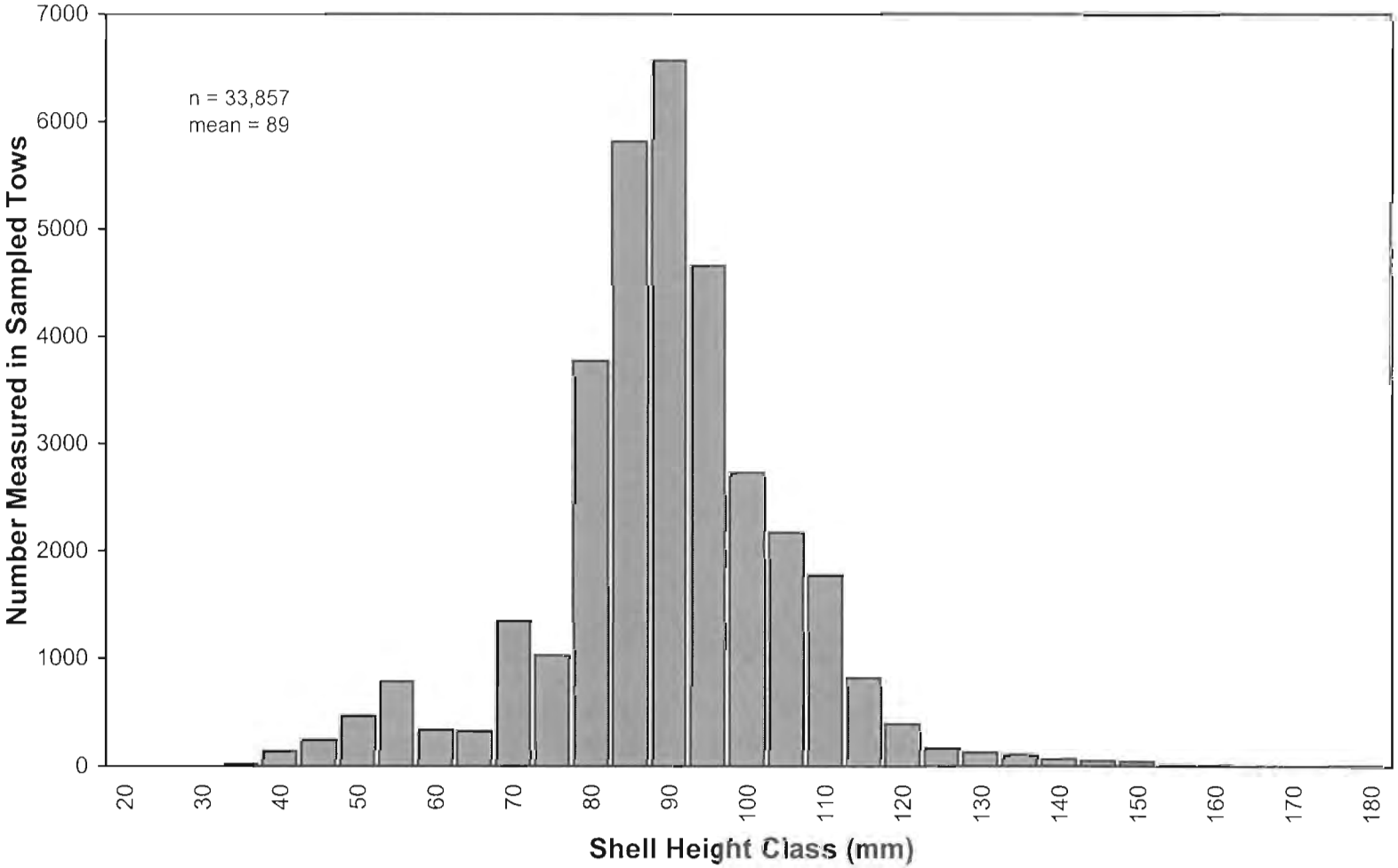

Figure 9. Shell height distribution of intact discarded scallops from observer samples, Shelikof District, Kodiak Area, 1997/98.

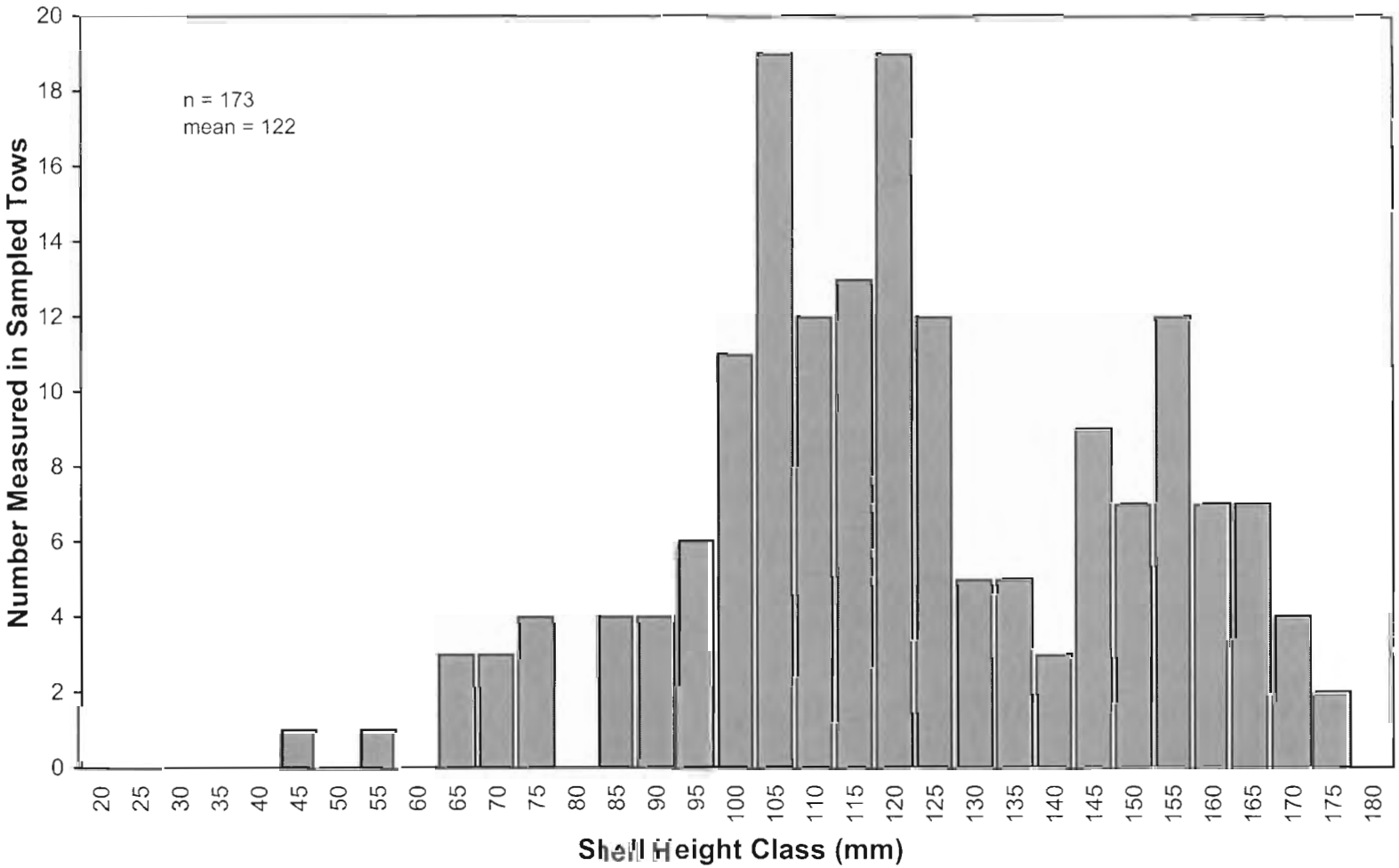

Figure 10. Shell height distribution of intact discarded scallops from observer samples, Semidi District, Kodiak Area, 1997/98.

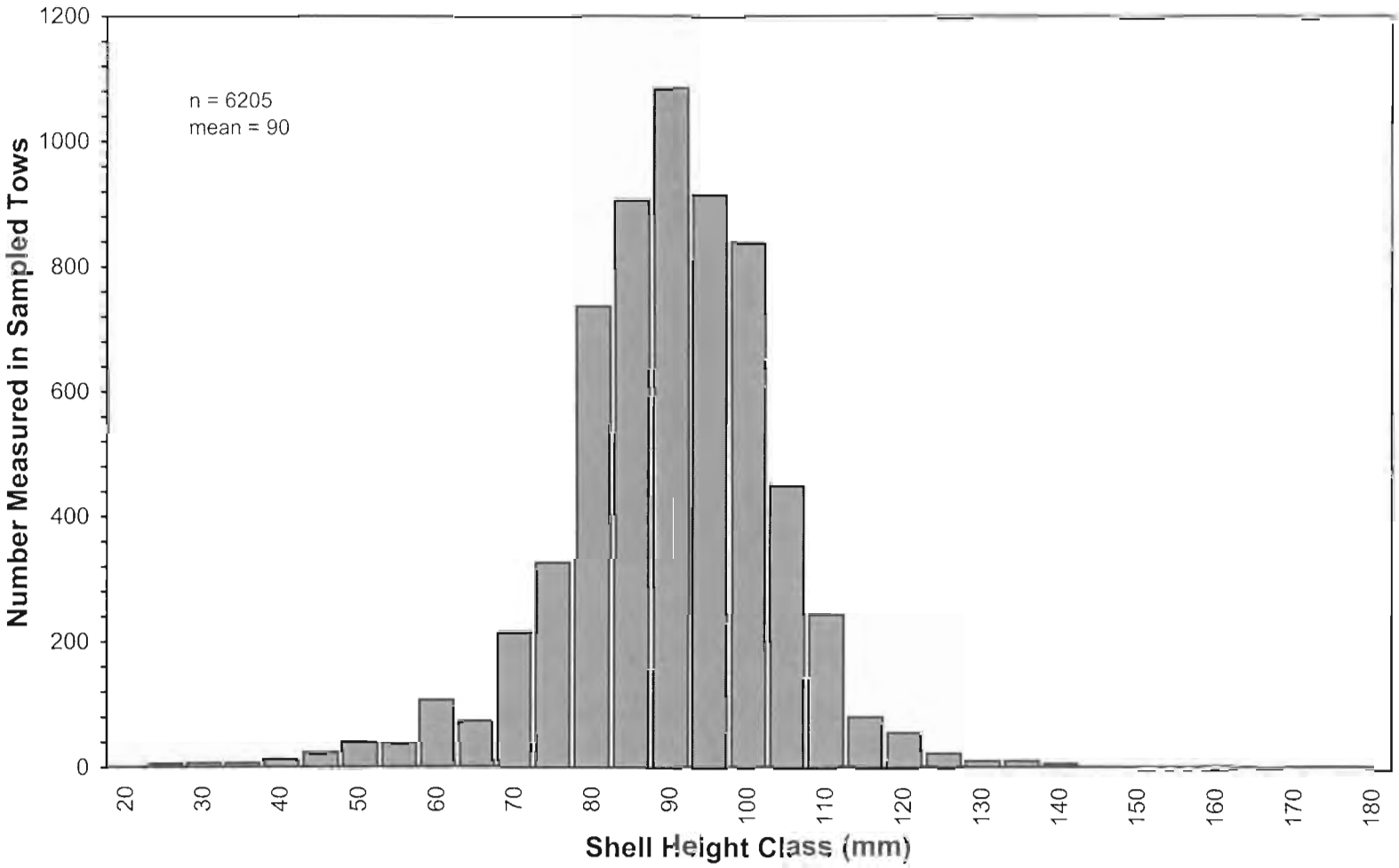

Figure 11. Shell height distribution of intact discarded scallops from observer samples, Alaska Peninsula Area, 1997/98.

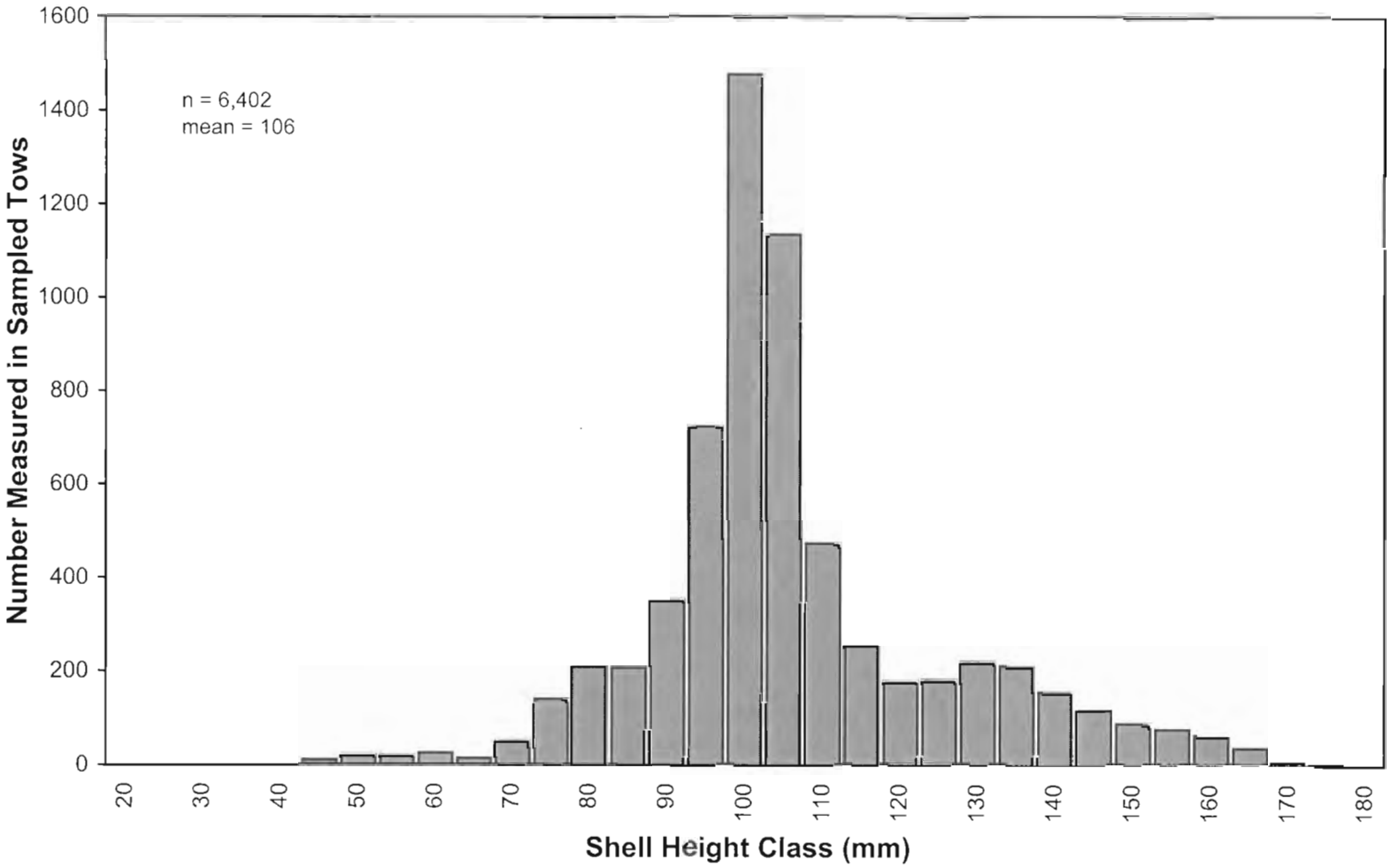

Figure 12. Shell height distribution of intact discarded scallops from observer samples, Bering Sea Area, 1997/98.

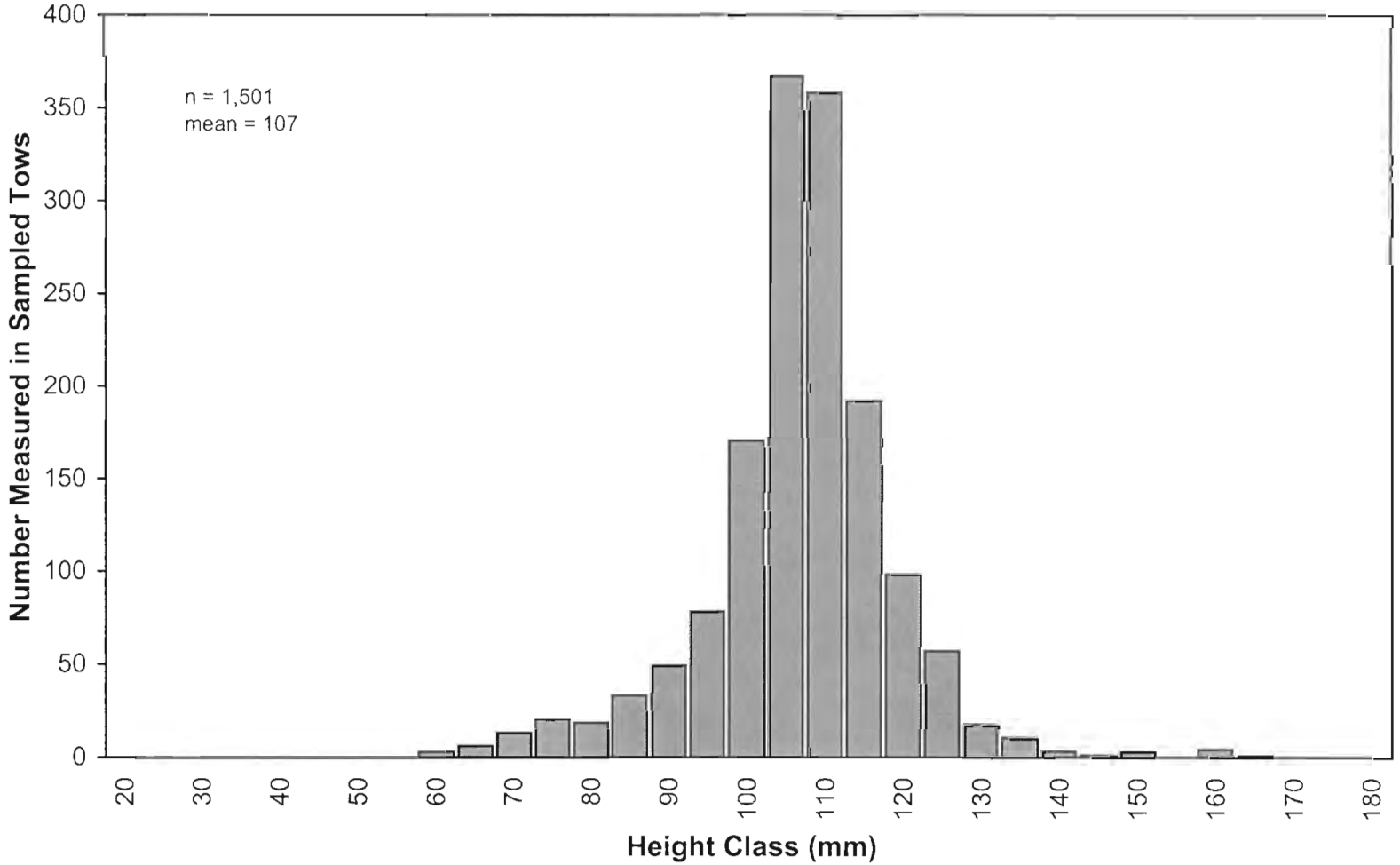

Figure 13. Shell height distribution of intact discarded scallops from observer samples, Dutch Harbor Area, 1997/98.

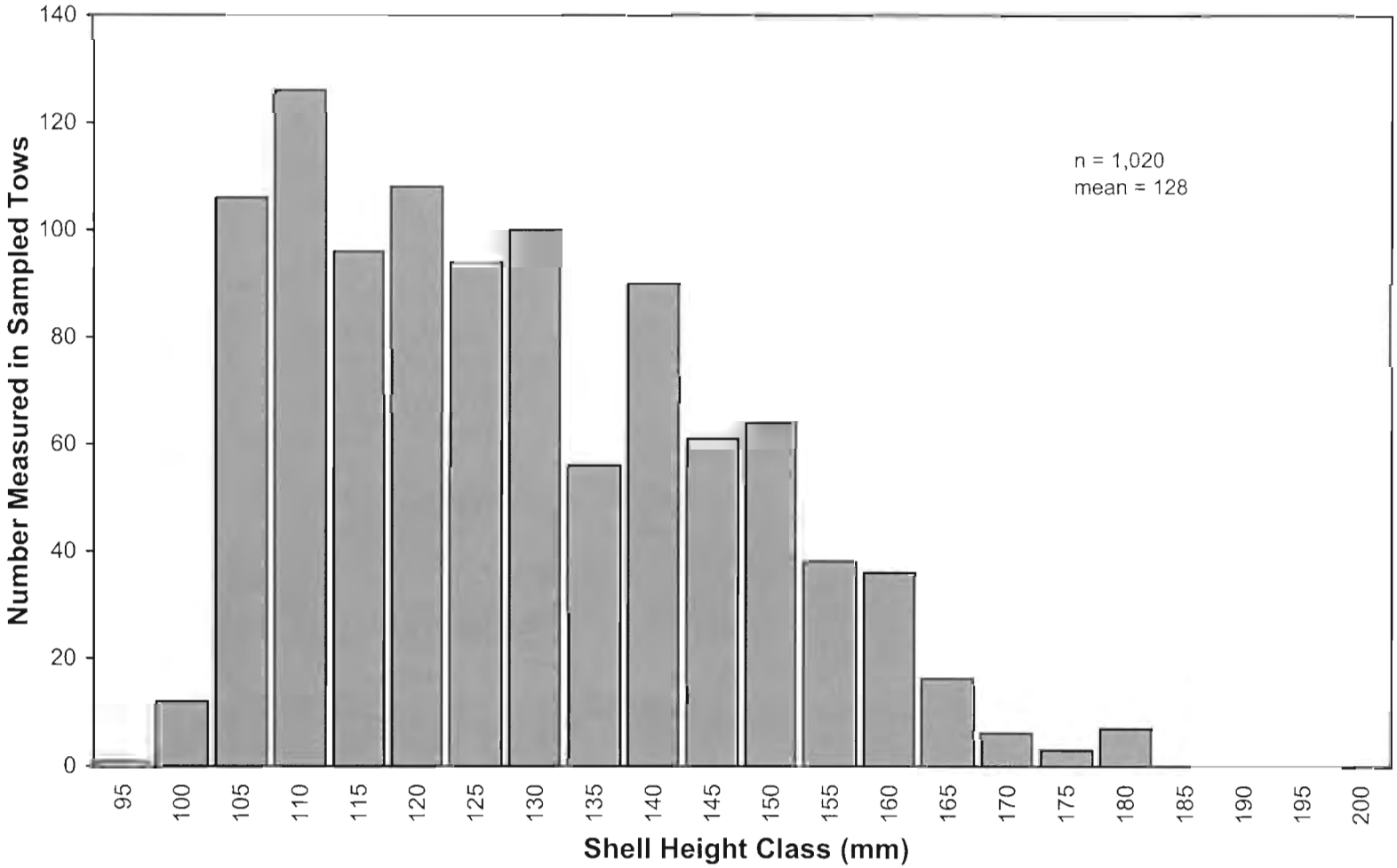

Figure 14. Shell height distribution observed in the retained scallop catch (males, females, and undetermined sex), District 16, 1997.

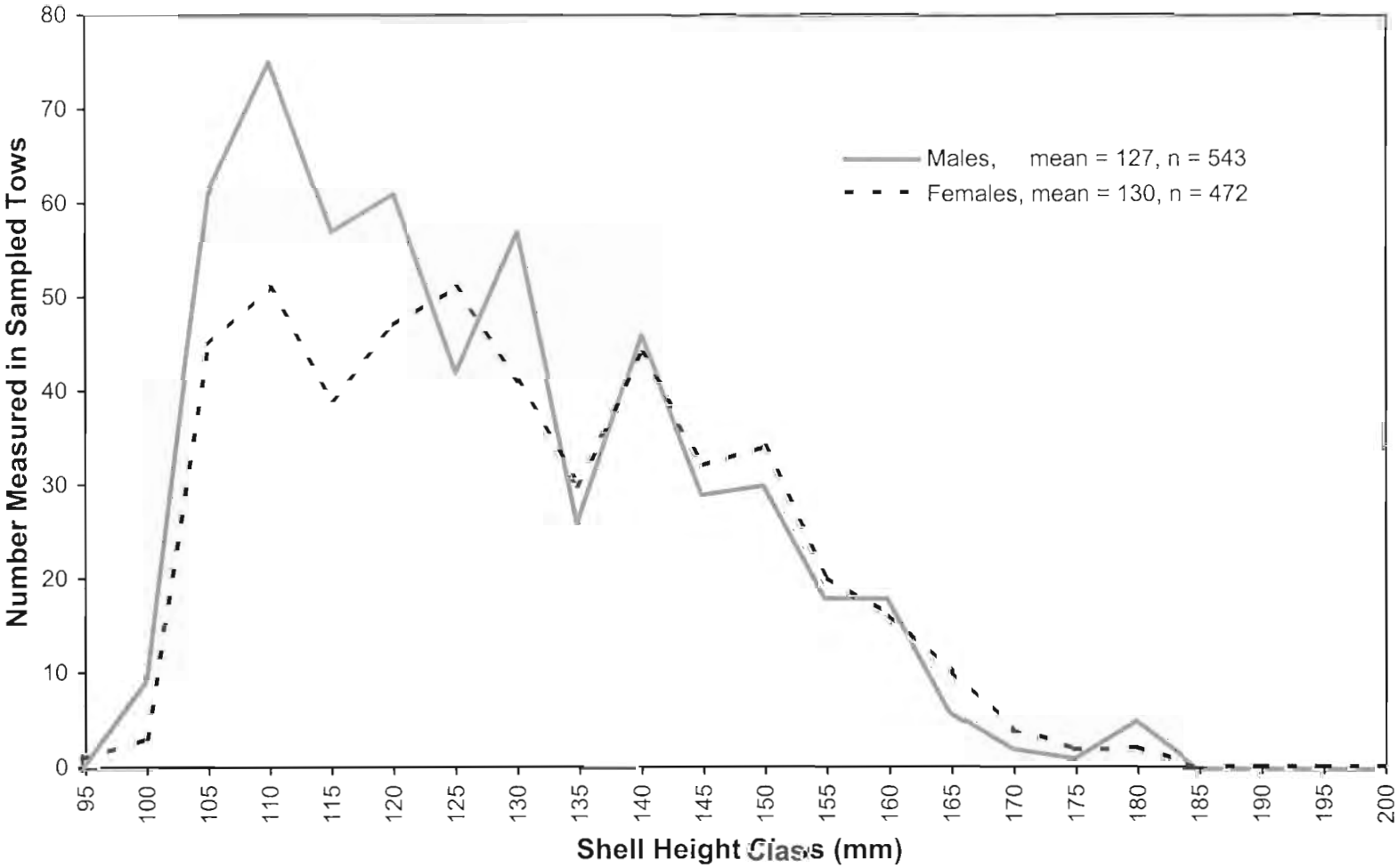

Figure 15. Shell height distribution observed in the retained scallop catch, District 16, 1997.

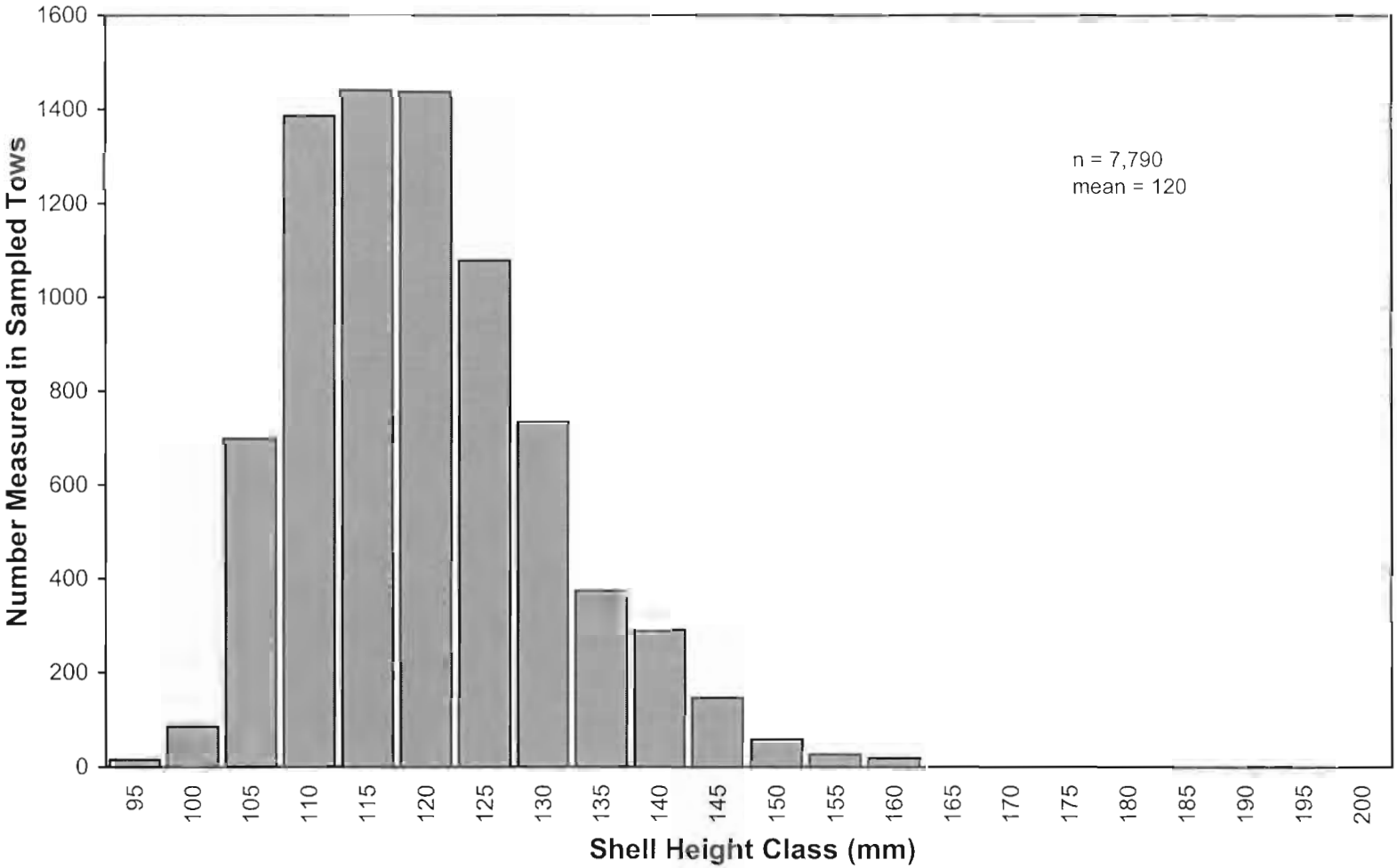

Figure 16. Shell height distribution observed in the retained scallop catch (males, females, and undetermined sex), Yakutat, 1997.

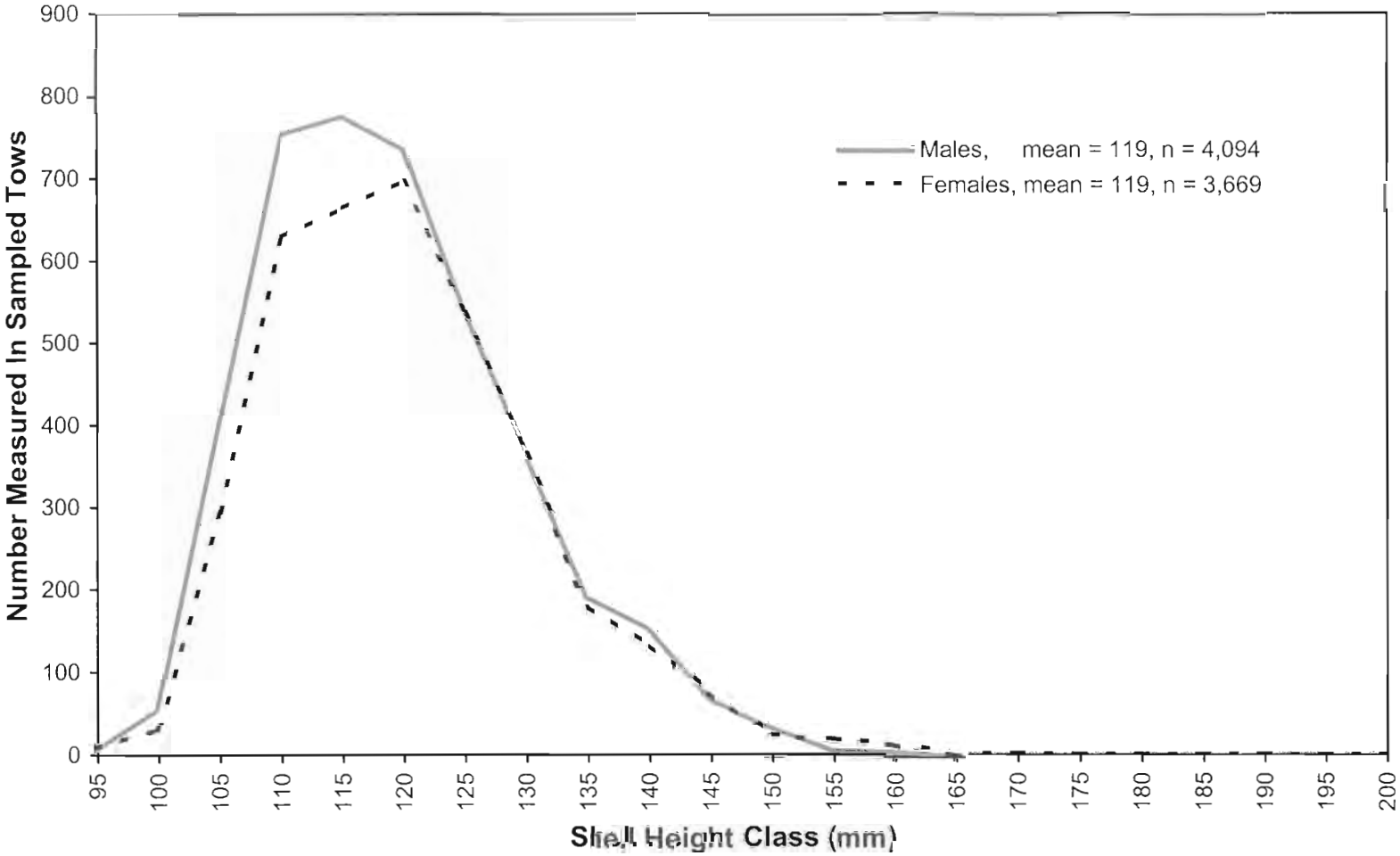

Figure 17. Shell height distribution observed in the retained scallop catch, Yakutat Area, 1997.

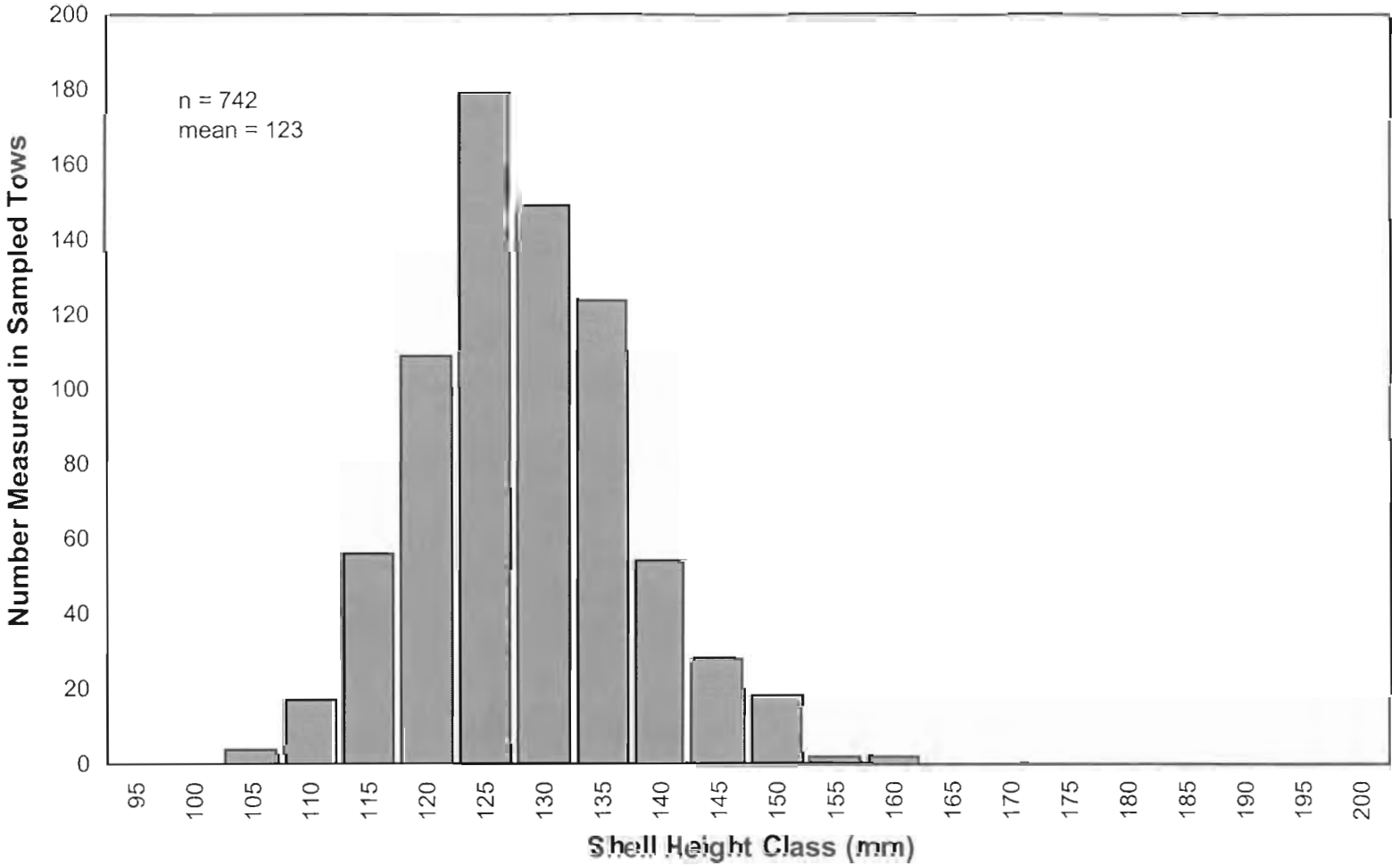

Figure 18. Shell height distribution observed in the retained scallop catch (males, females, and undetermined sex), Prince William Sound Area, 1997.

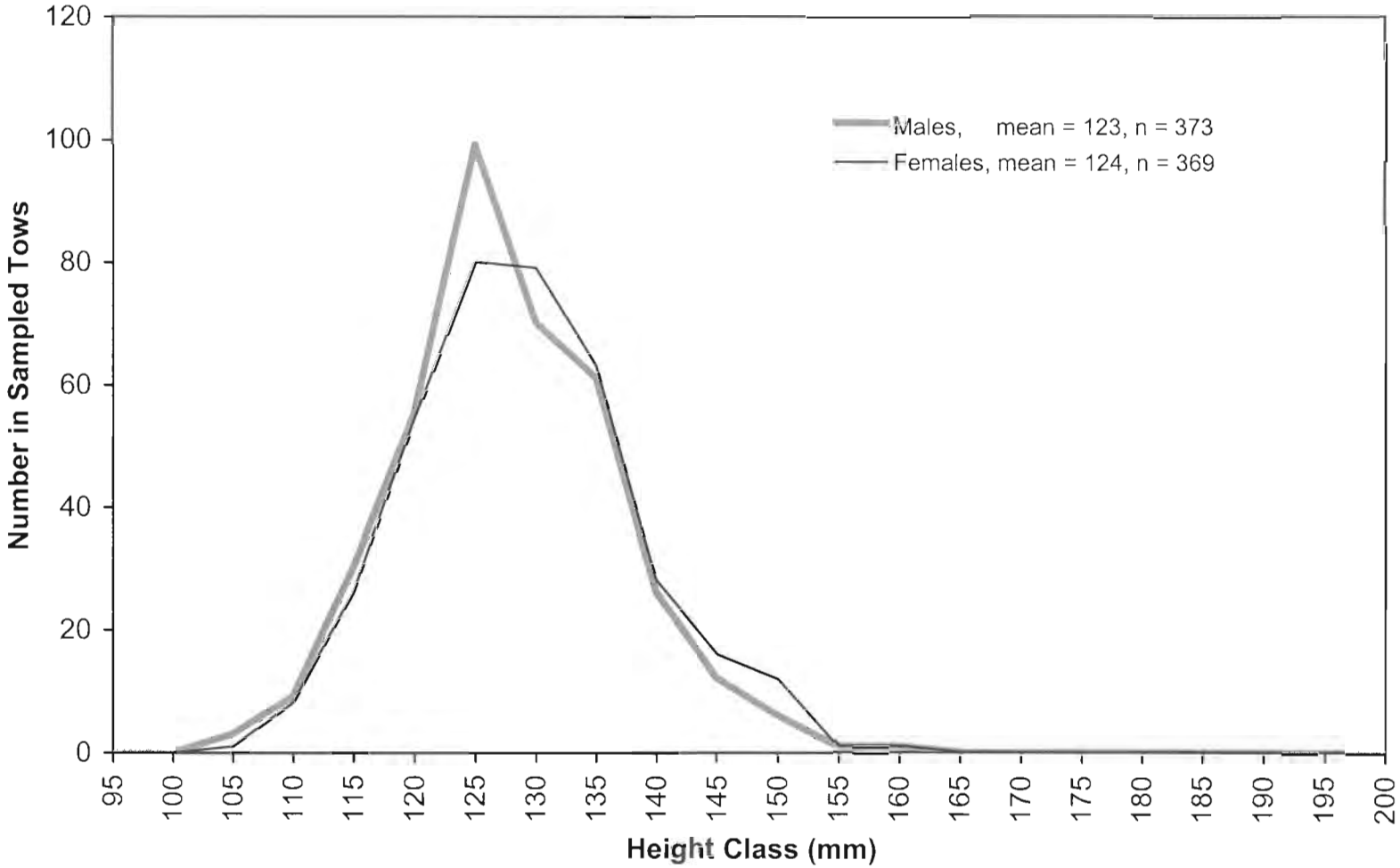

Figure 19. Shell height distribution observed in the retained scallop catch, Prince William Sound Area, 1997.

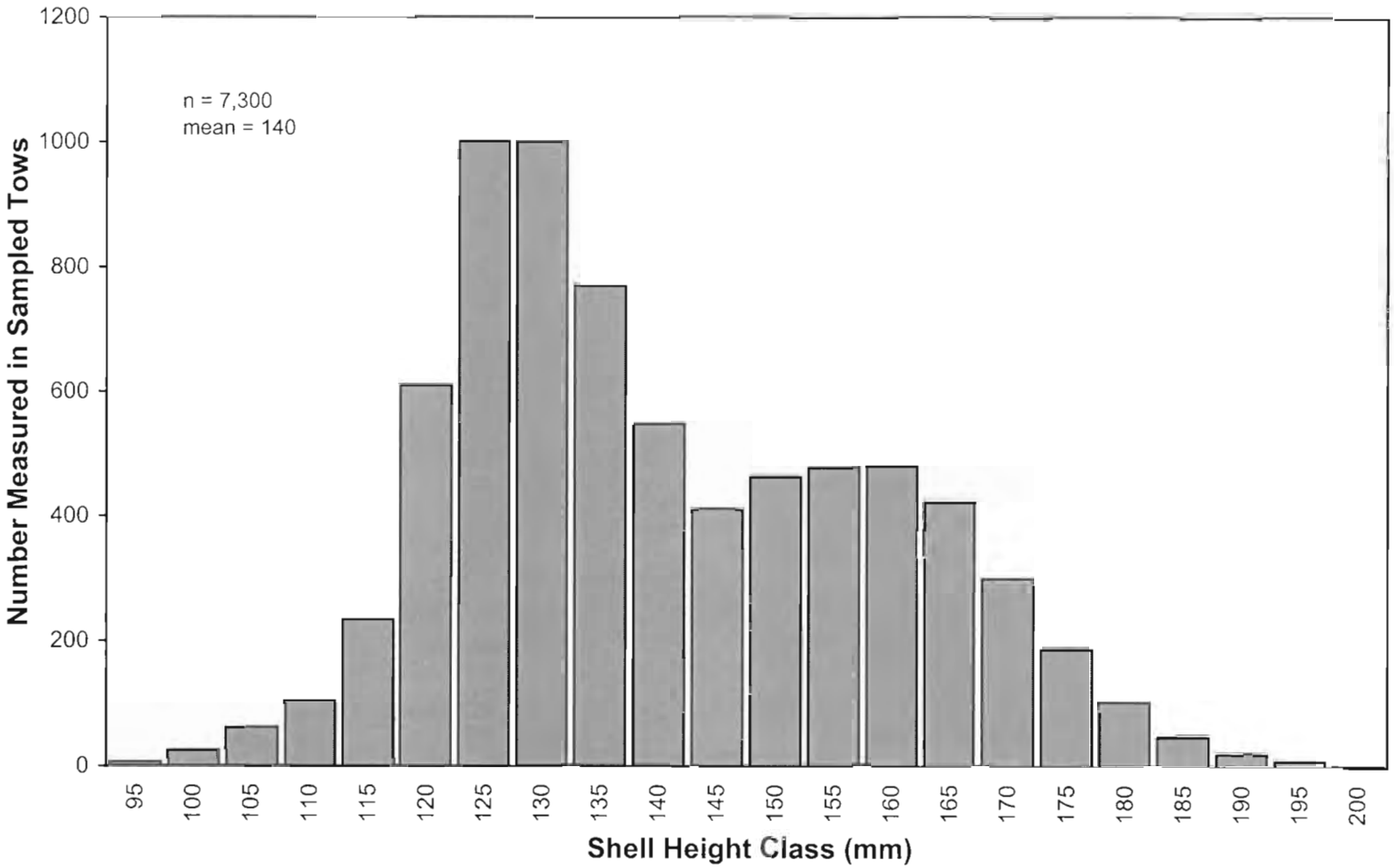

Figure 20. Shell height distribution observed in the retained scallop catch (males, females, and undetermined sex), Northeast District, Kodiak Area, 1997/98.

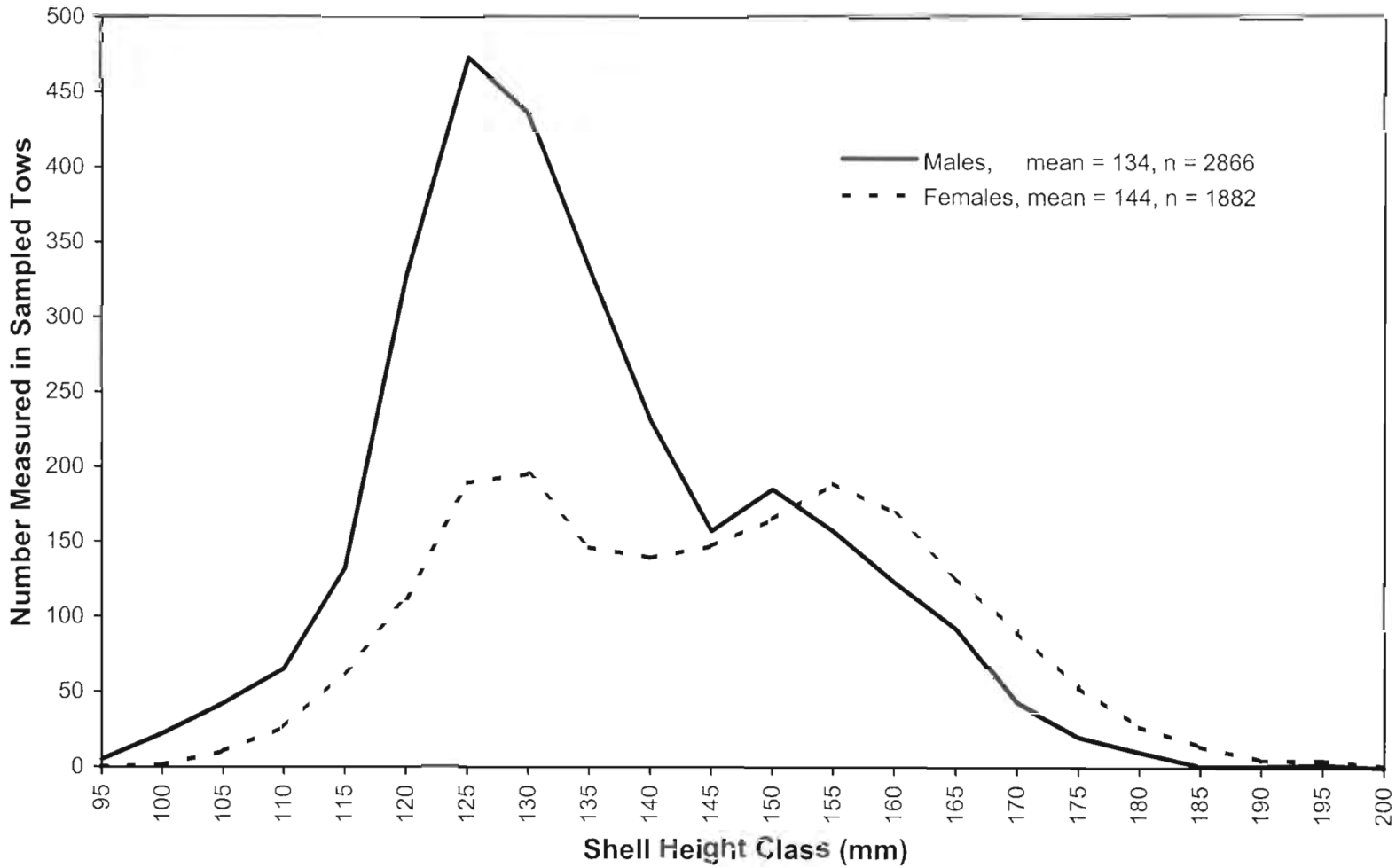

Figure 21. Shell height distribution observed in the retained scallop catch, Northeast District, Kodiak Area, 1997/98.

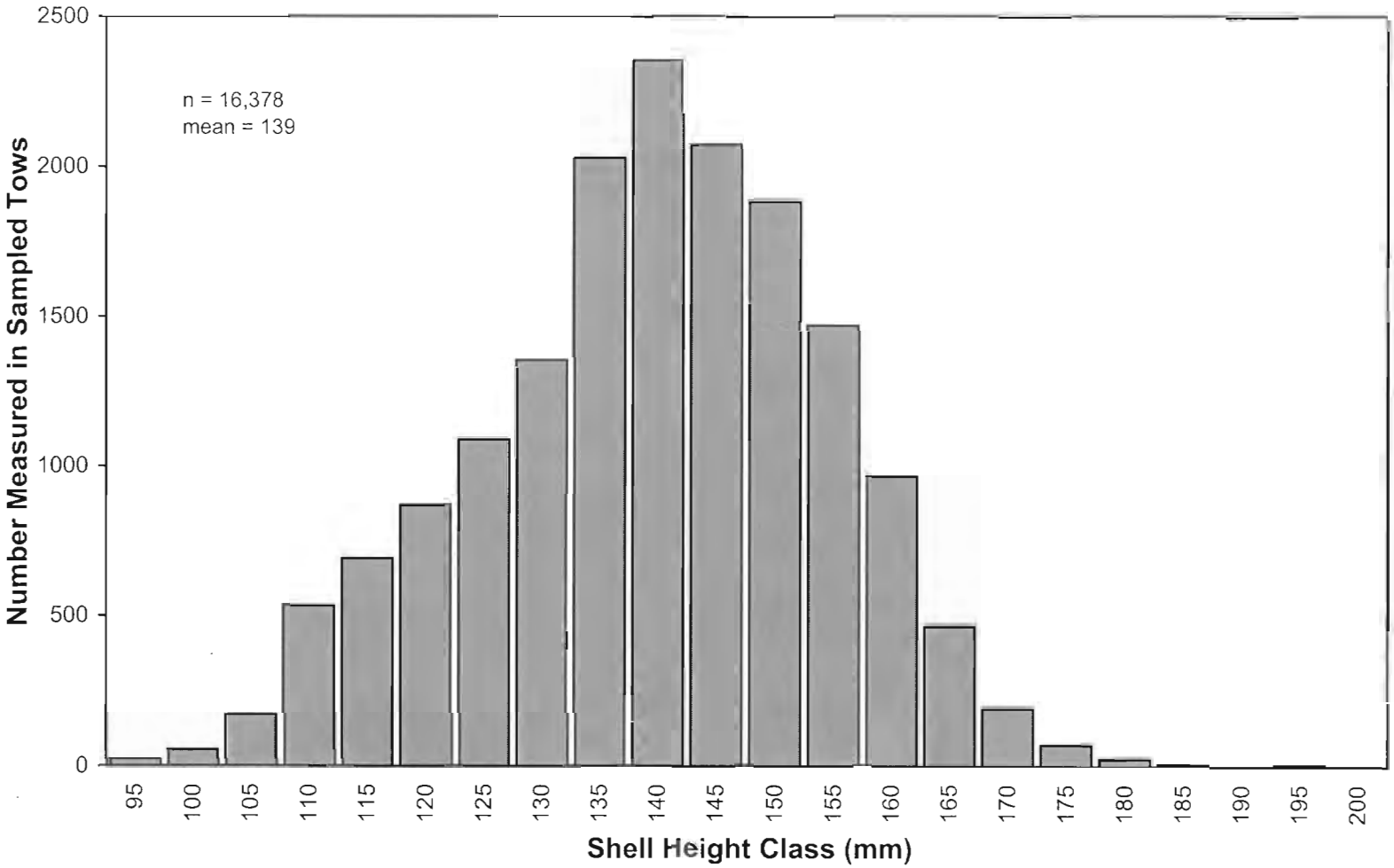

Figure 22. Shell height distribution observed in the retained scallop catch (males, females, and undetermined sex), Shelikof District, Kodiak Area, 1997/98.

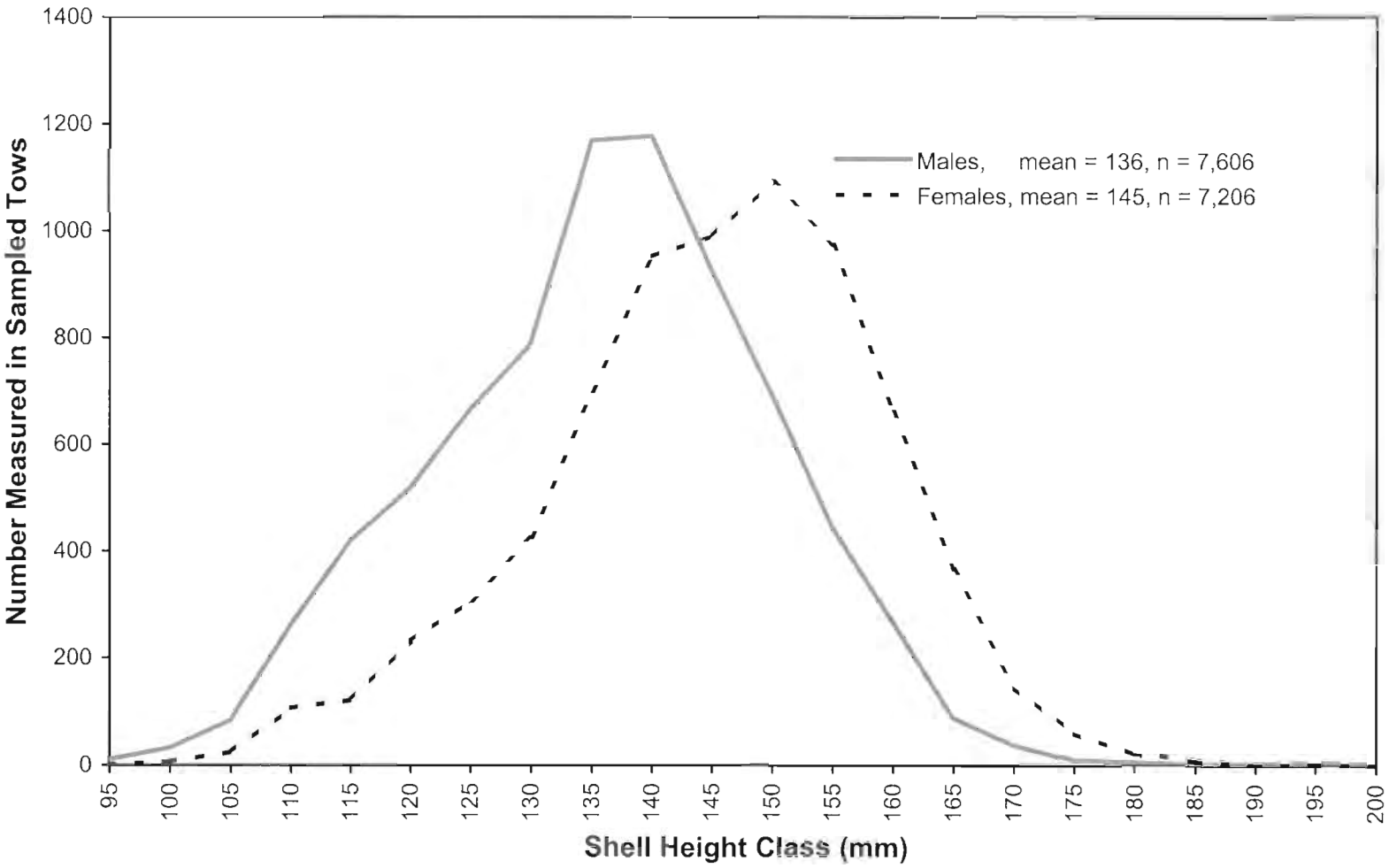

Figure 23. Shell height distribution observed in the retained scallop catch, Shelikof District, Kodiak Area, 1997/98.

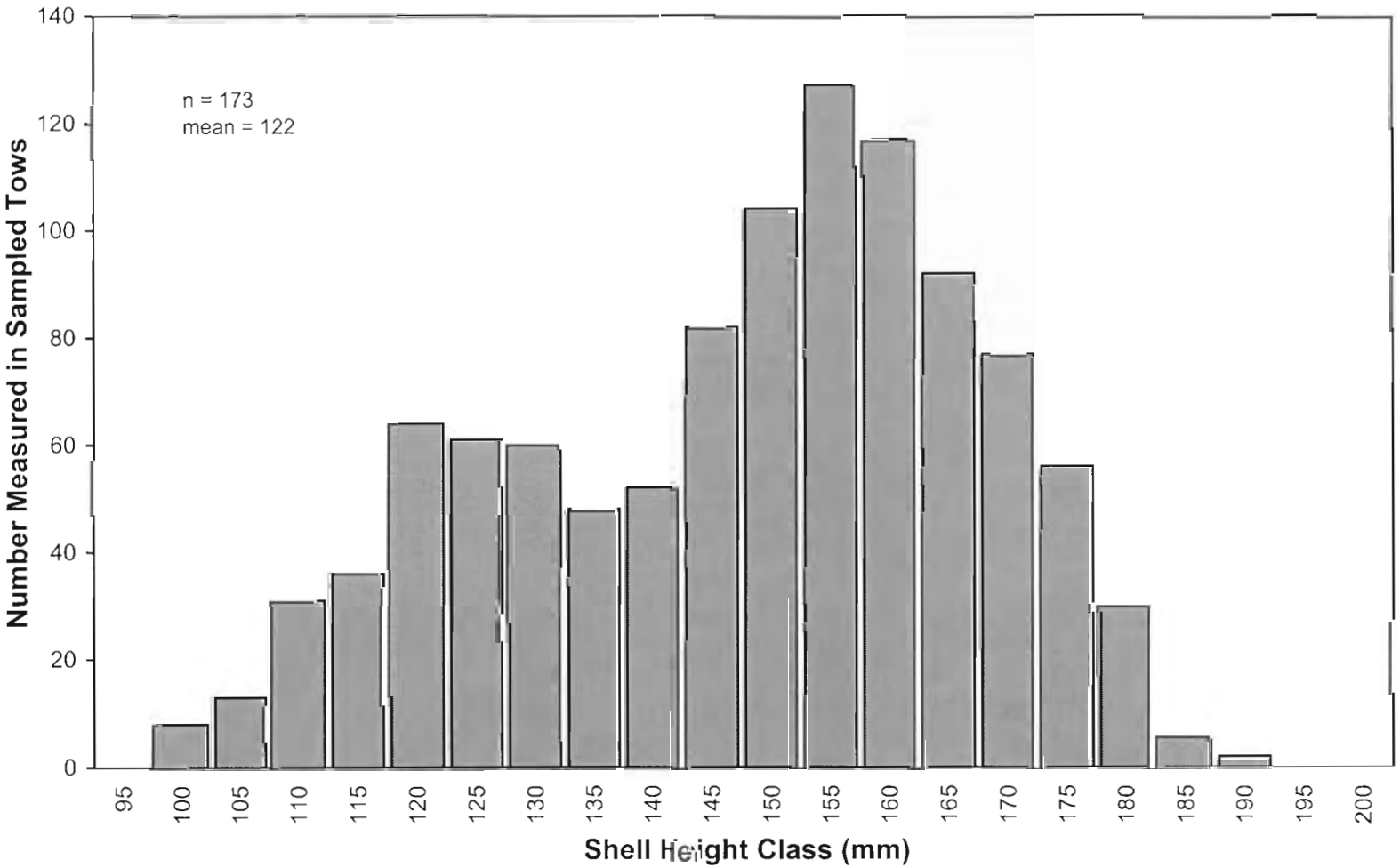

Figure 24. Shell height distribution observed in the retained scallop catch (males, females, and undetermined sex), Semidi District, Kodiak Area, 1997/98.

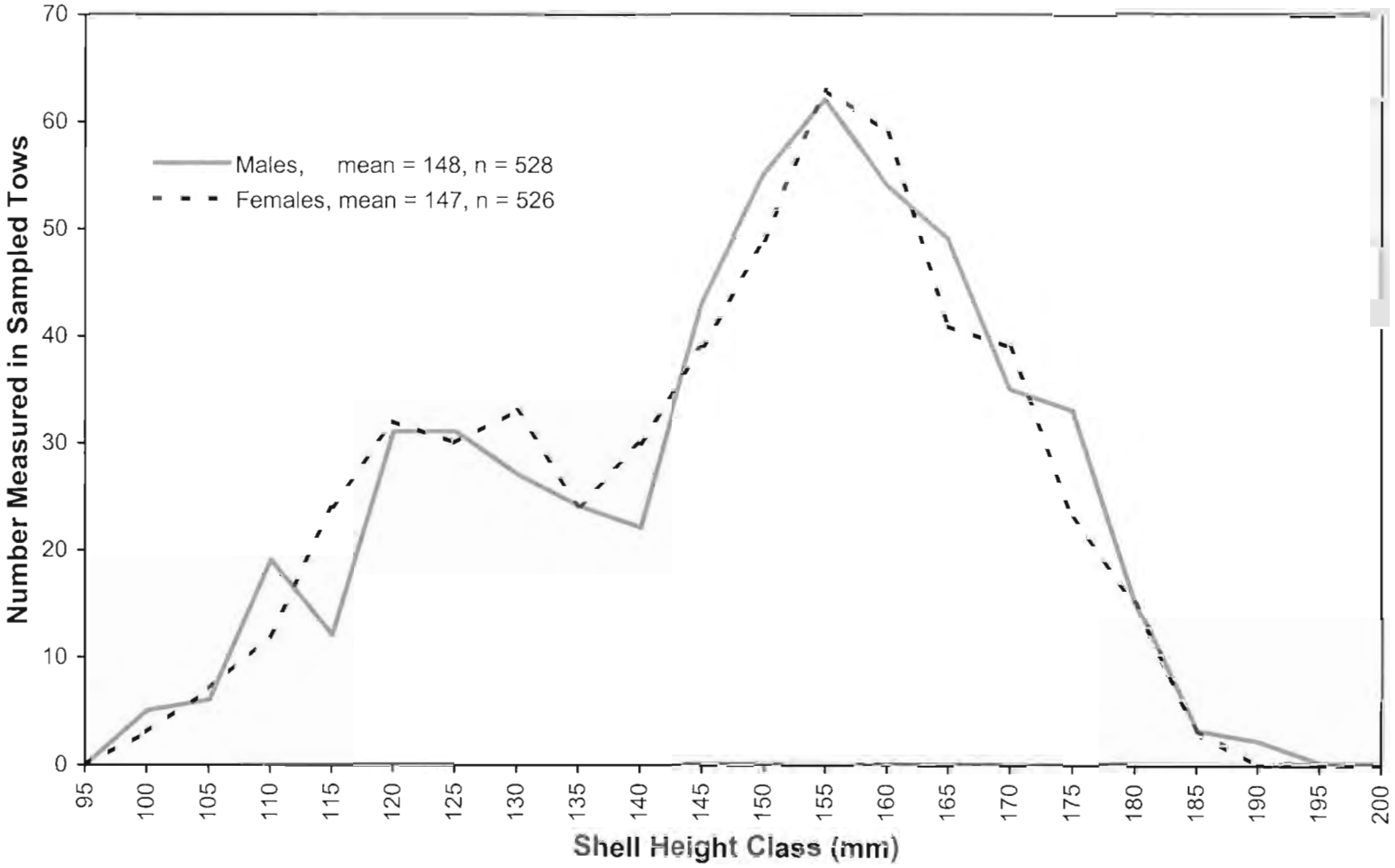

Figure 25. Shell height distribution observed in the retained scallop catch, Semidi District, Kodiak Area, 1997/98.

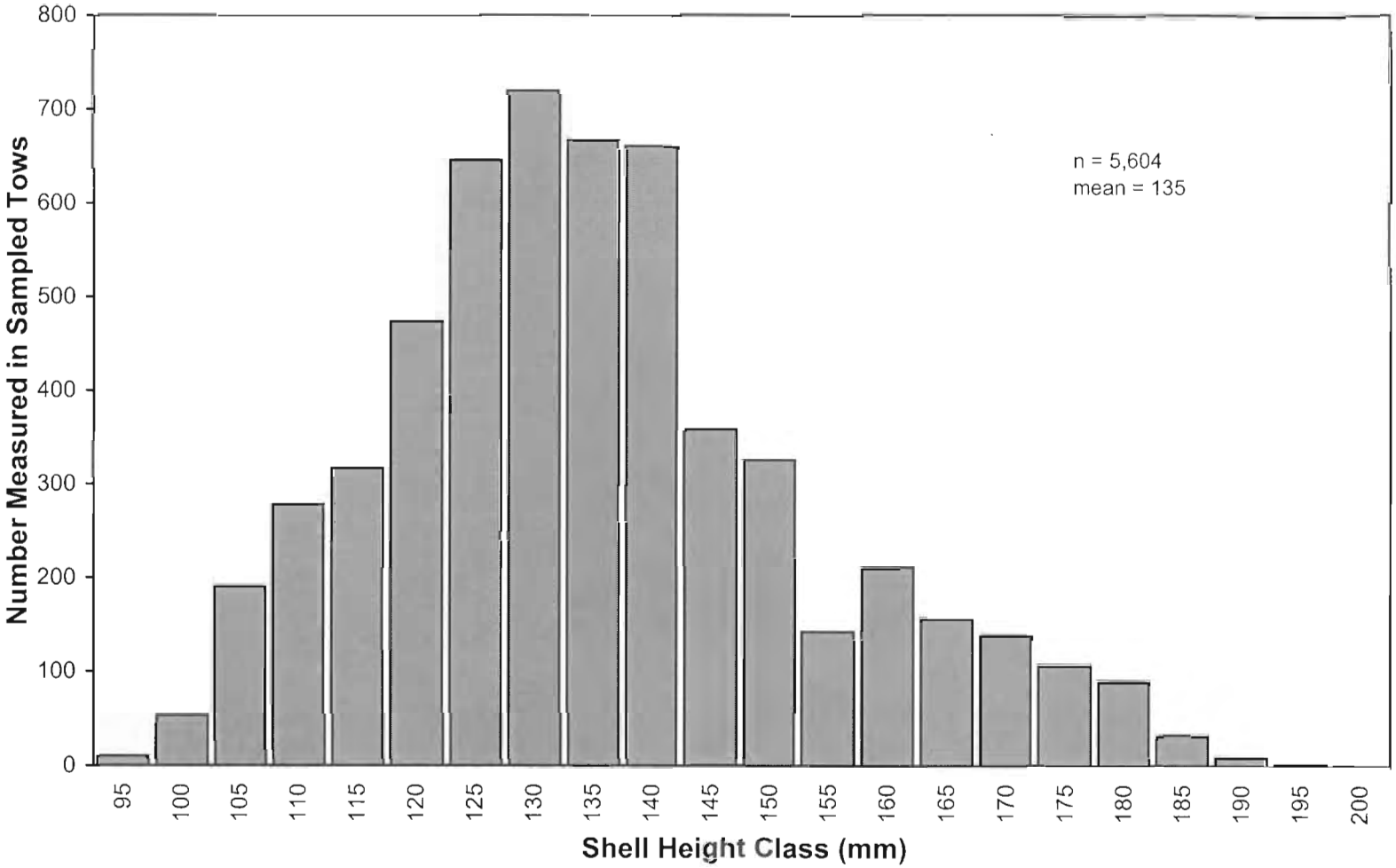

Figure 26. Shell height distribution observed in the retained scallop catch (males, females, and undetermined sex), Alaska Peninsula Area, 1997/98.

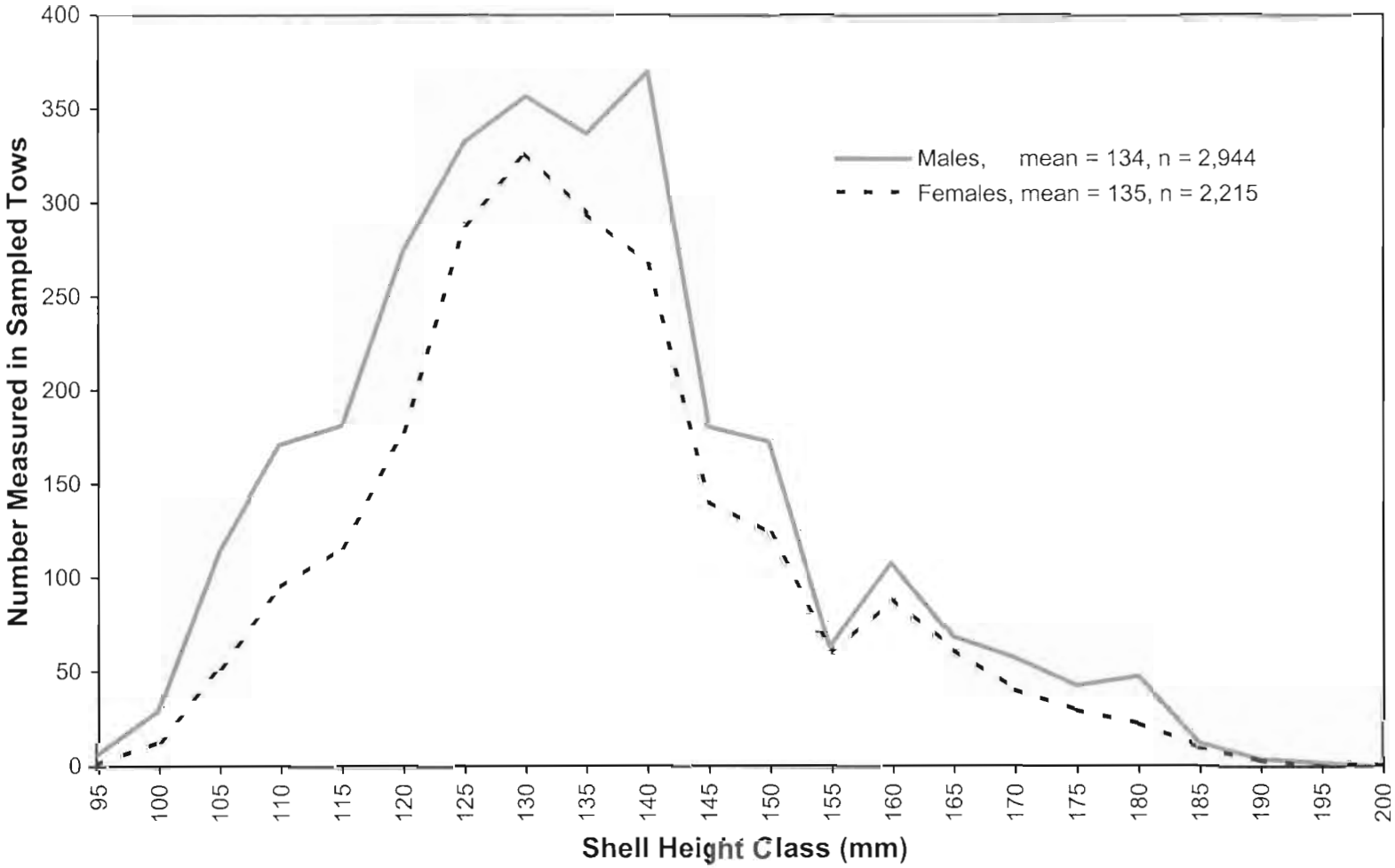

Figure 27. Shell height distribution observed in the retained scallop catch, Alaska Peninsula Area, 1997/98.

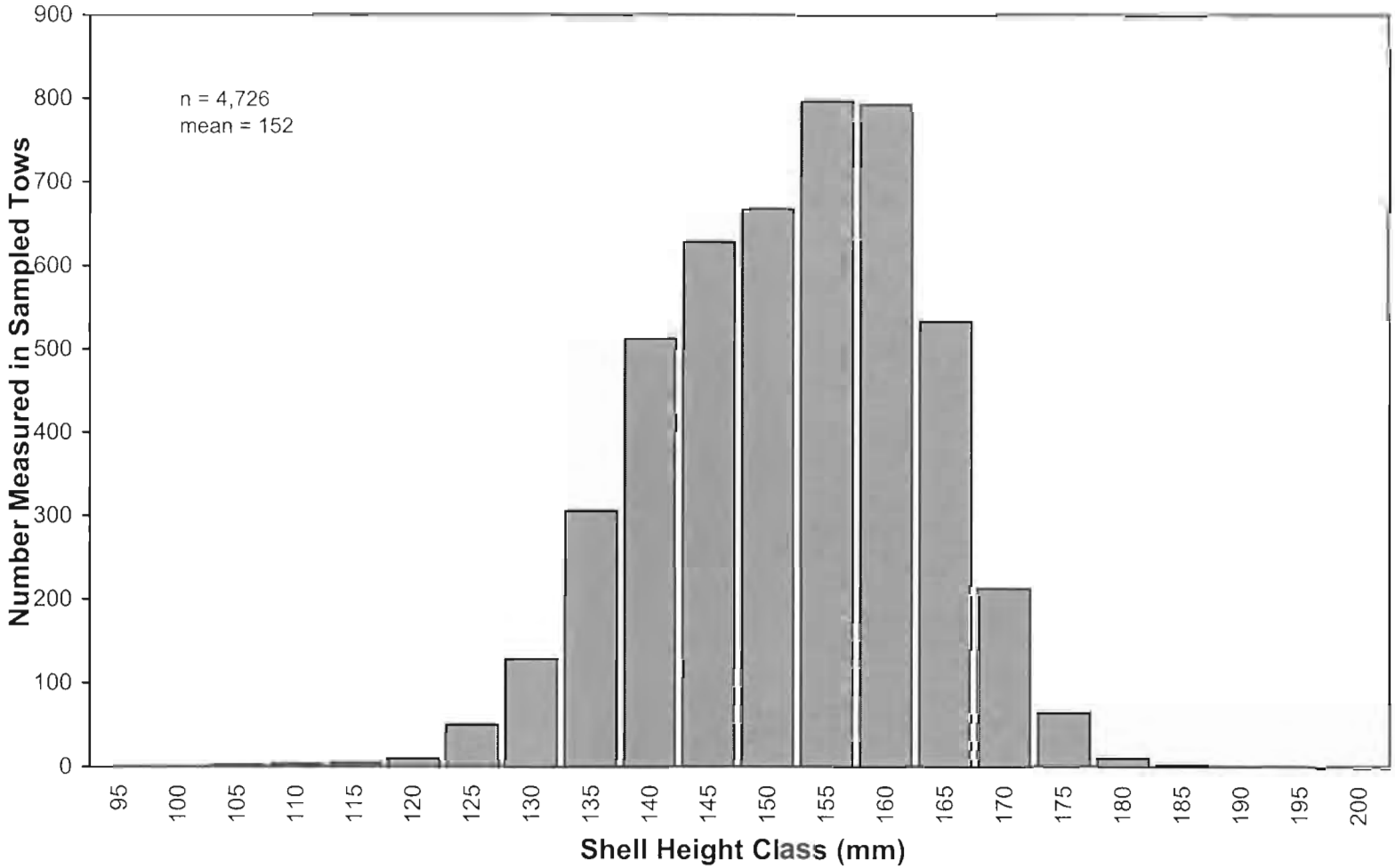

Figure 28. Shell height distribution observed in the retained scallop catch (males, females, and undetermined sex), Bering Sea Area, 1997/98.

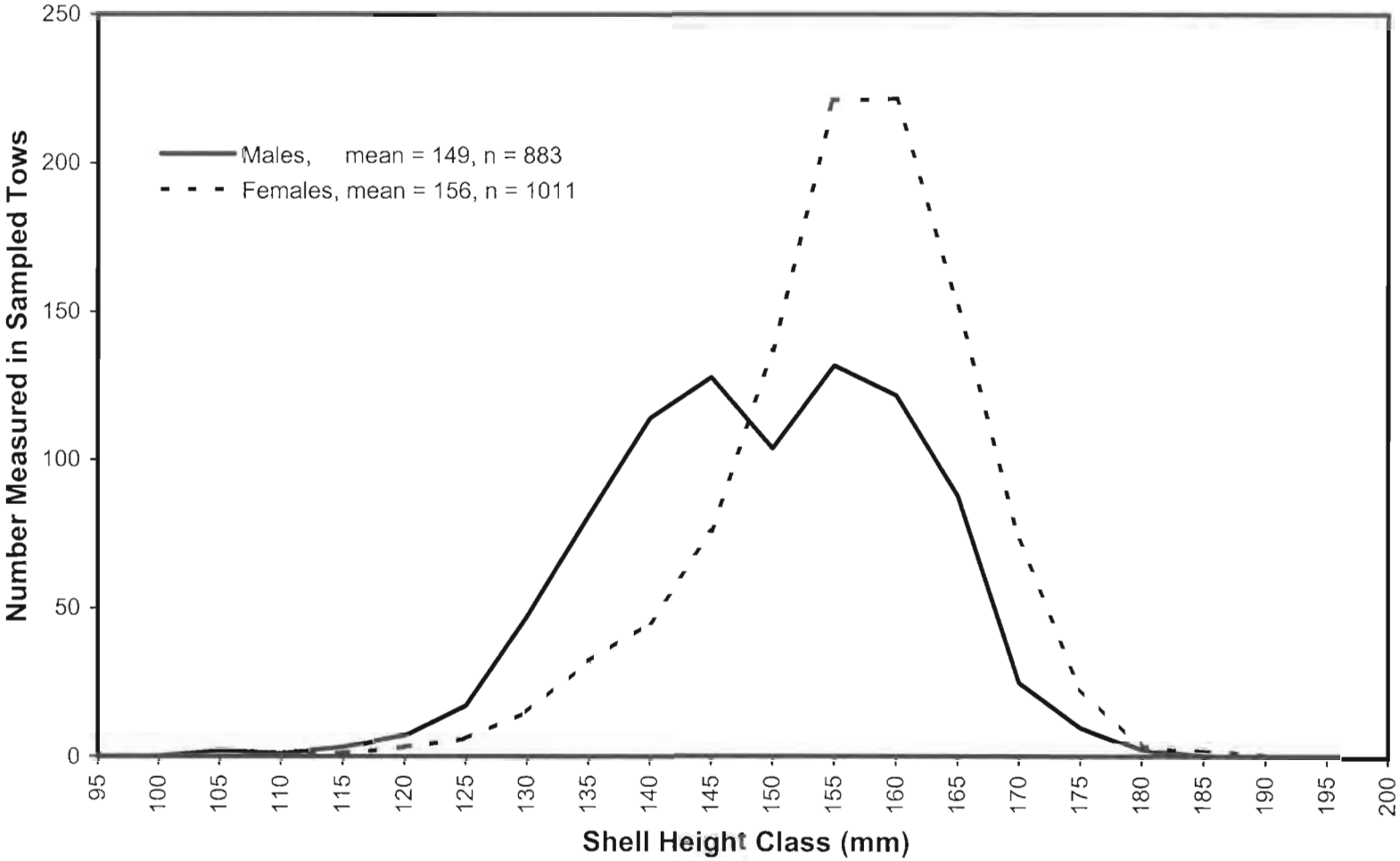

Figure 29. Shell height distribution observed in the retained scallop catch, Bering Sea Area, 1997/98.

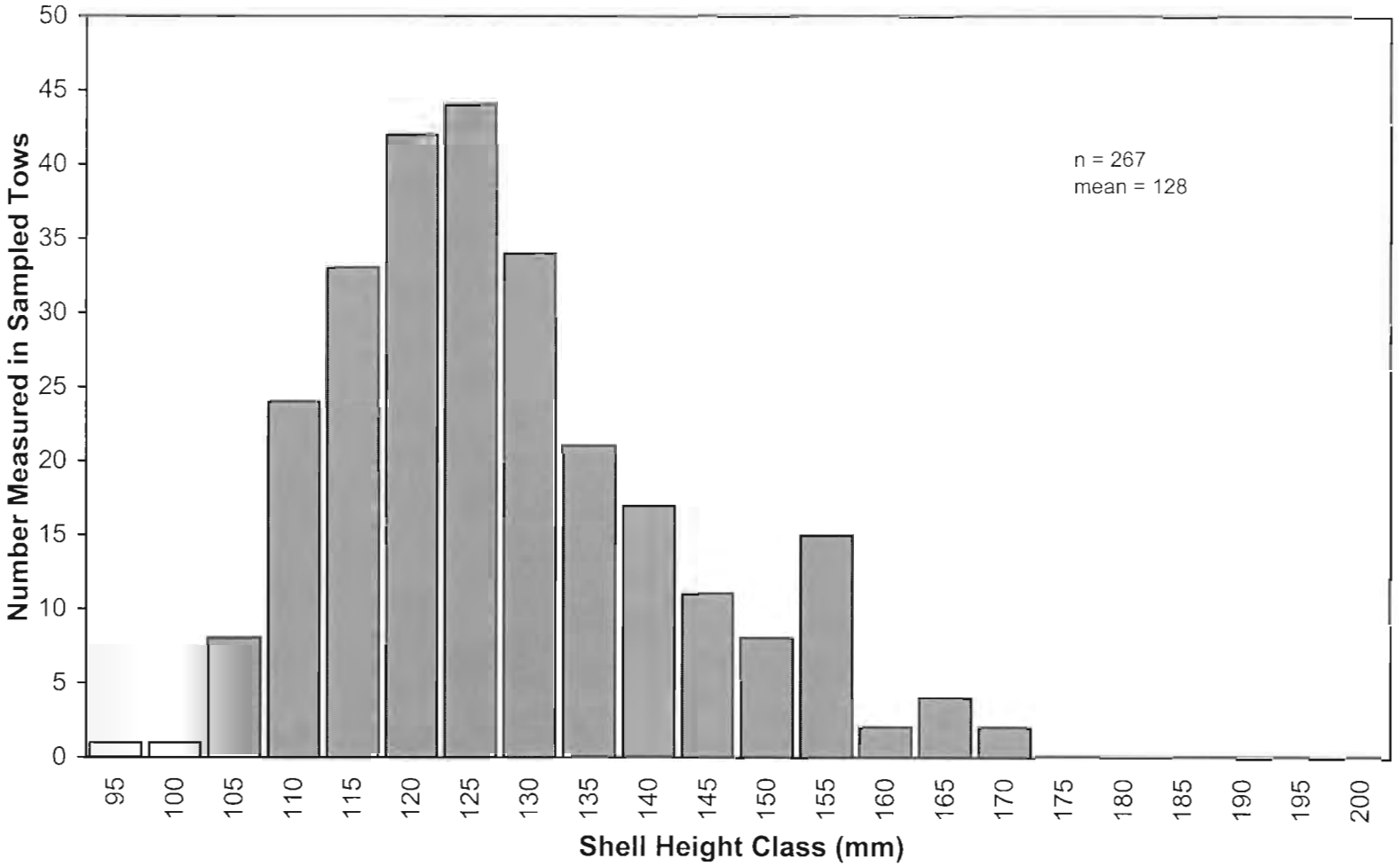

Figure 30. Shell height distribution observed in the retained scallop catch (males, females, and undetermined sex), Dutch Harbor Area, 1997/98.

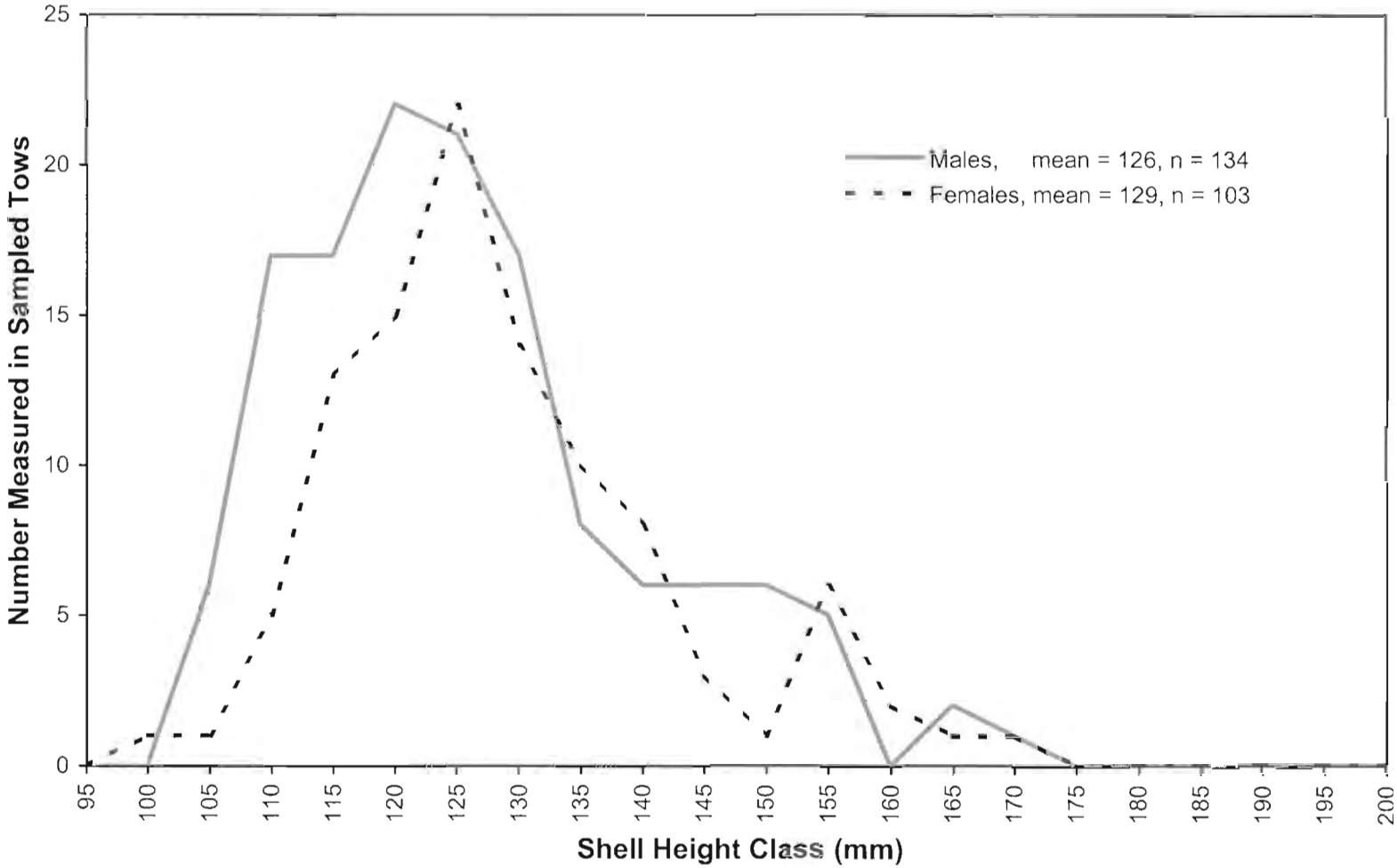

Figure 31. Shell height distribution observed in the retained scallop catch, Dutch Harbor Area, Area, 1997/98.

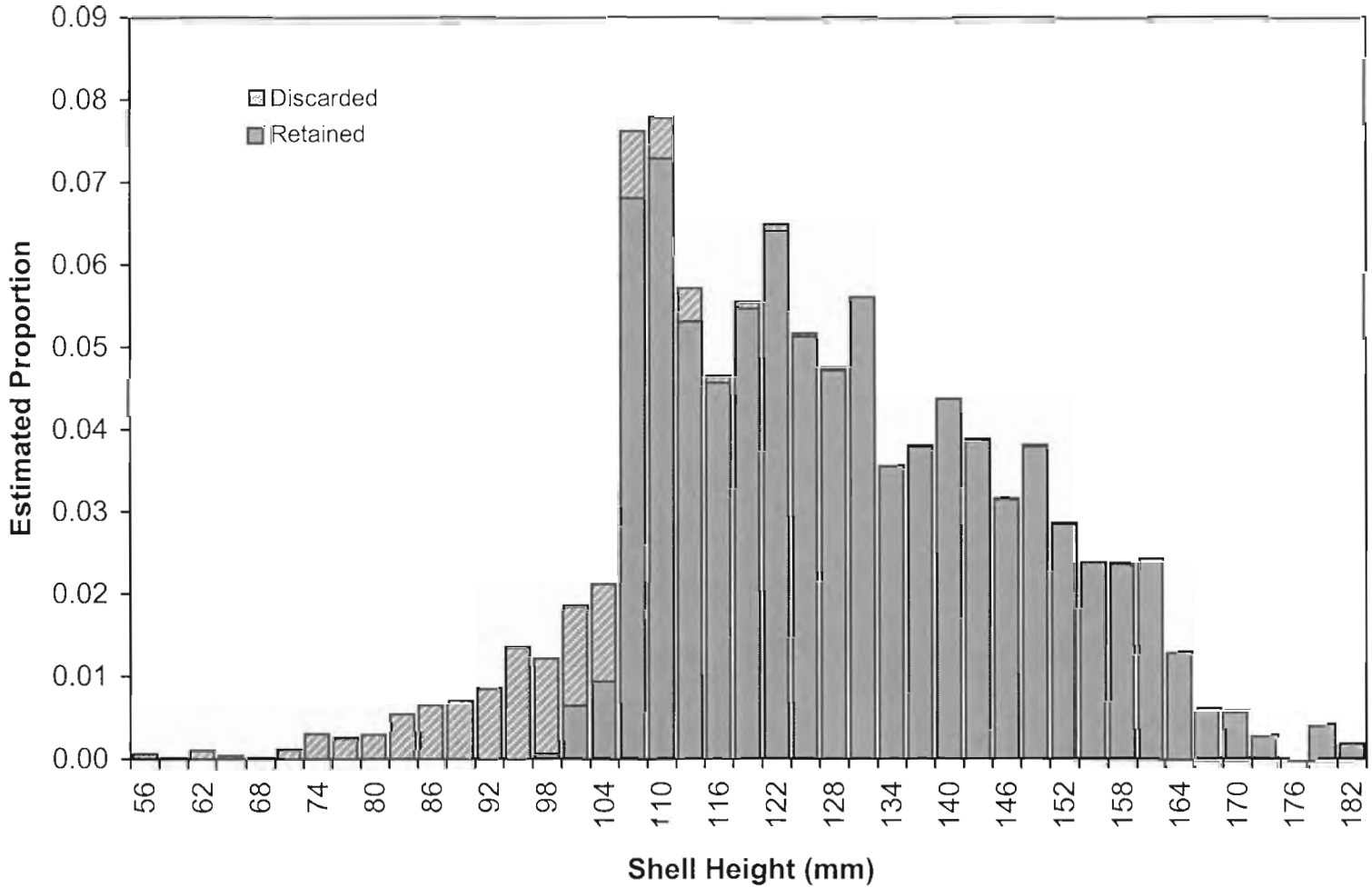

Figure 32. Estimated shell height distribution from resampling observer scallop measurements (males, females, and undetermined sex), District 16, 1997.

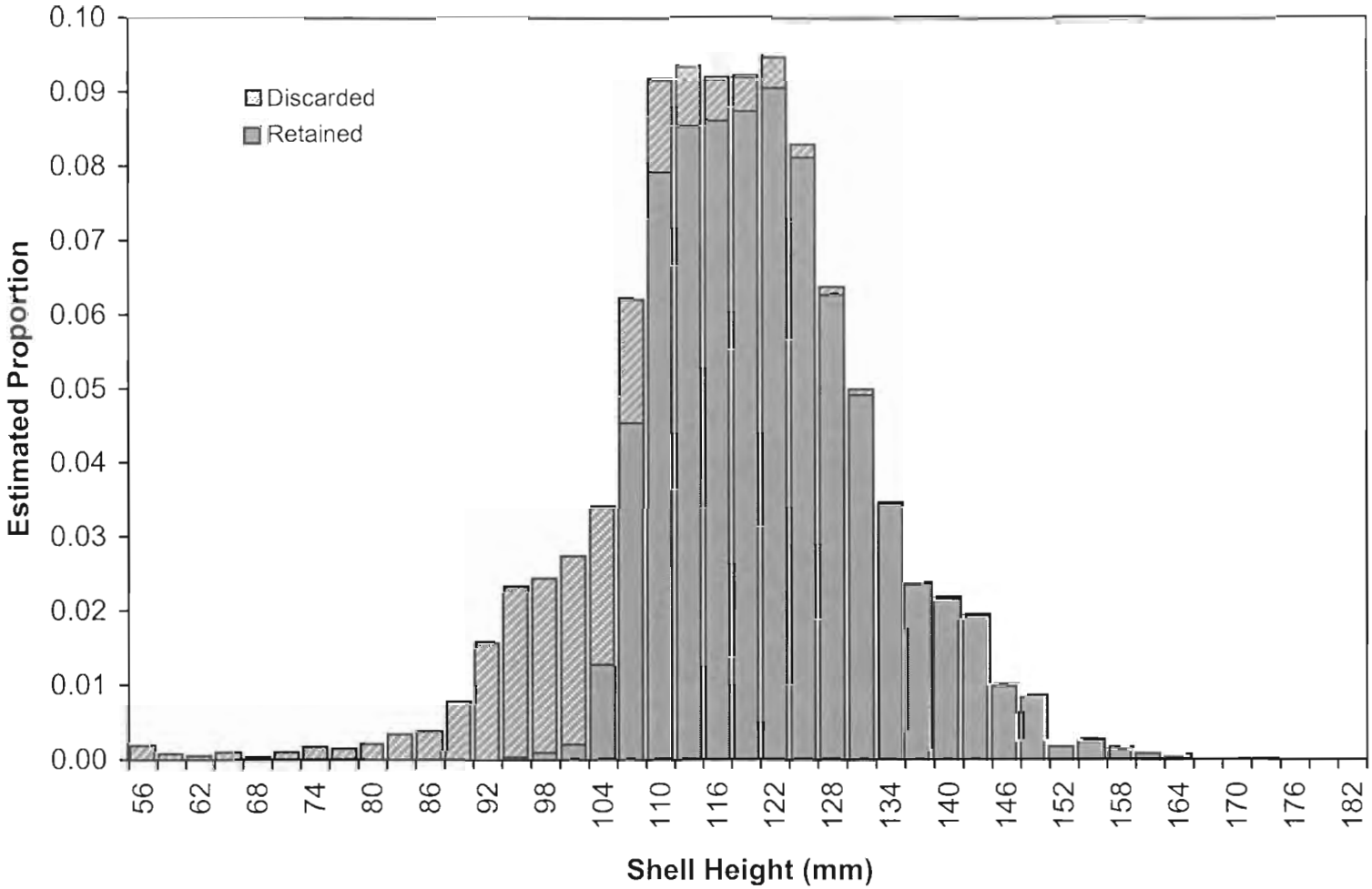

Figure 33. Estimated shell height distribution from resampling observer scallop measurements (males, females, and undetermined sex), Yakutat Area, 1997.

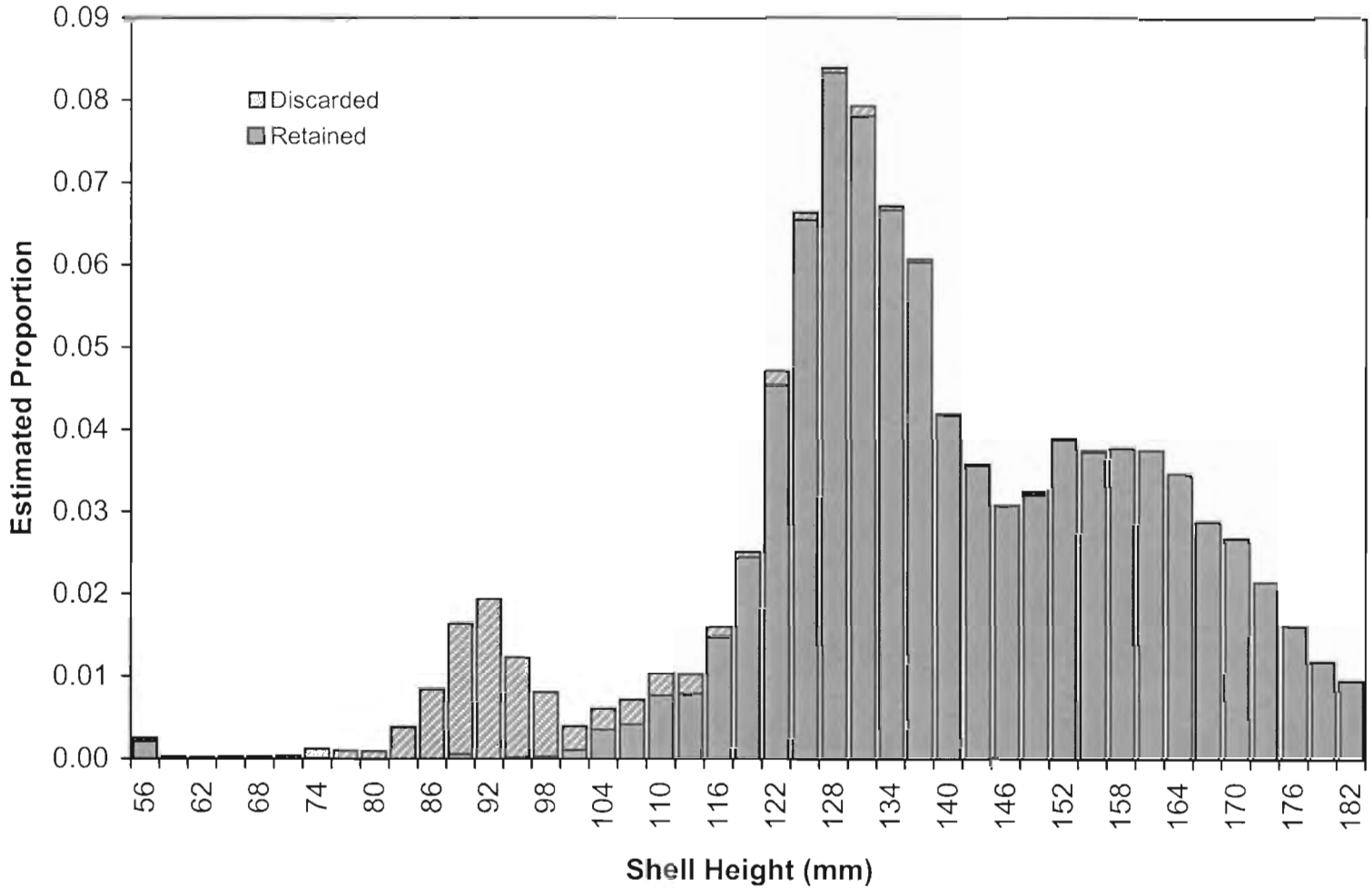

Figure 34. Estimated shell height distribution from resampling observer scallop measurements (males, females, and undetermined sex), Northeast District, Kodiak Area, 1997/98.

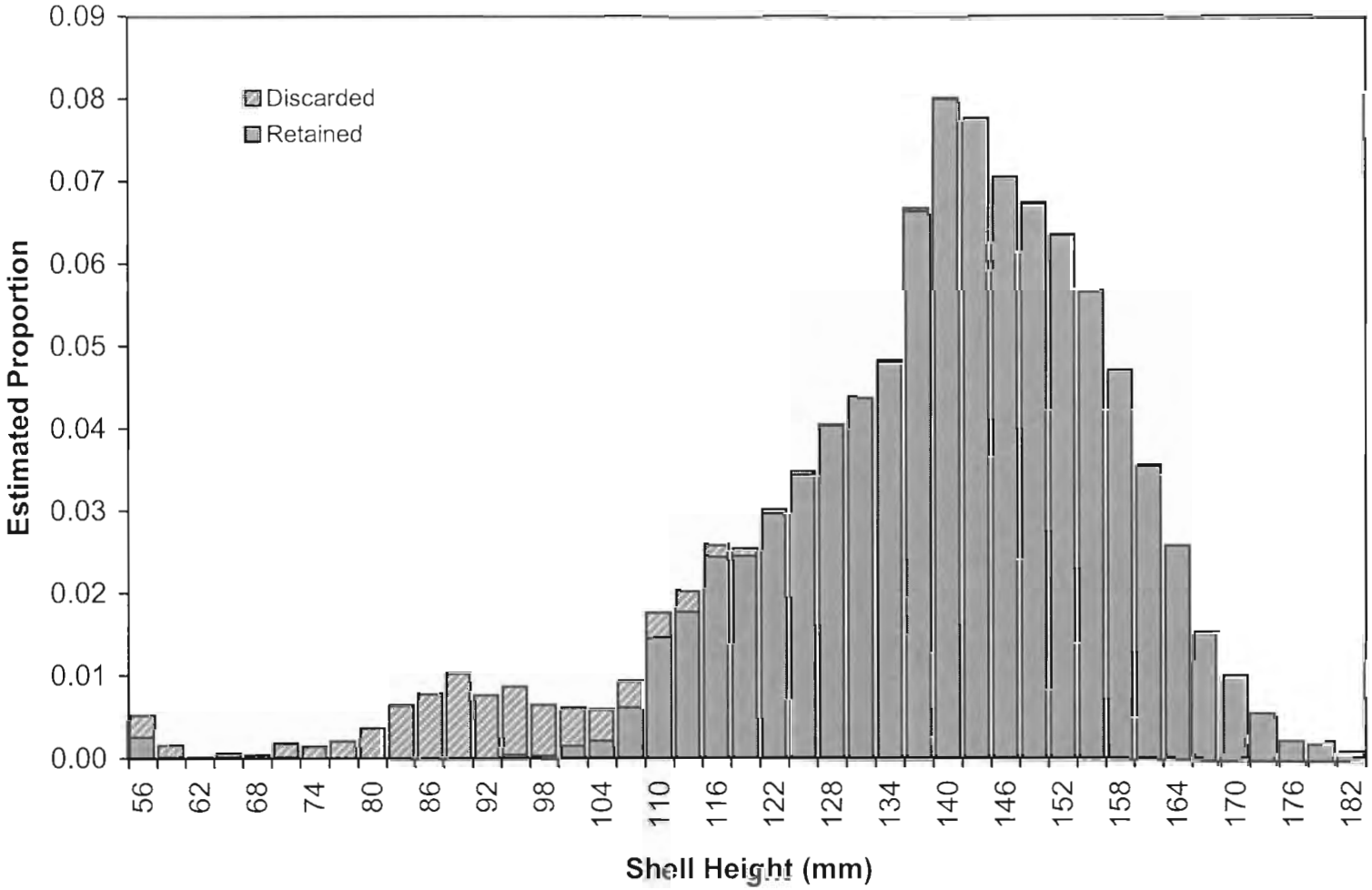

Figure 35. Estimated shell height distribution from resampling observer scallop measurements (males, females, and undetermined sex), Shelikof District, Kodiak Area, 1997/98.

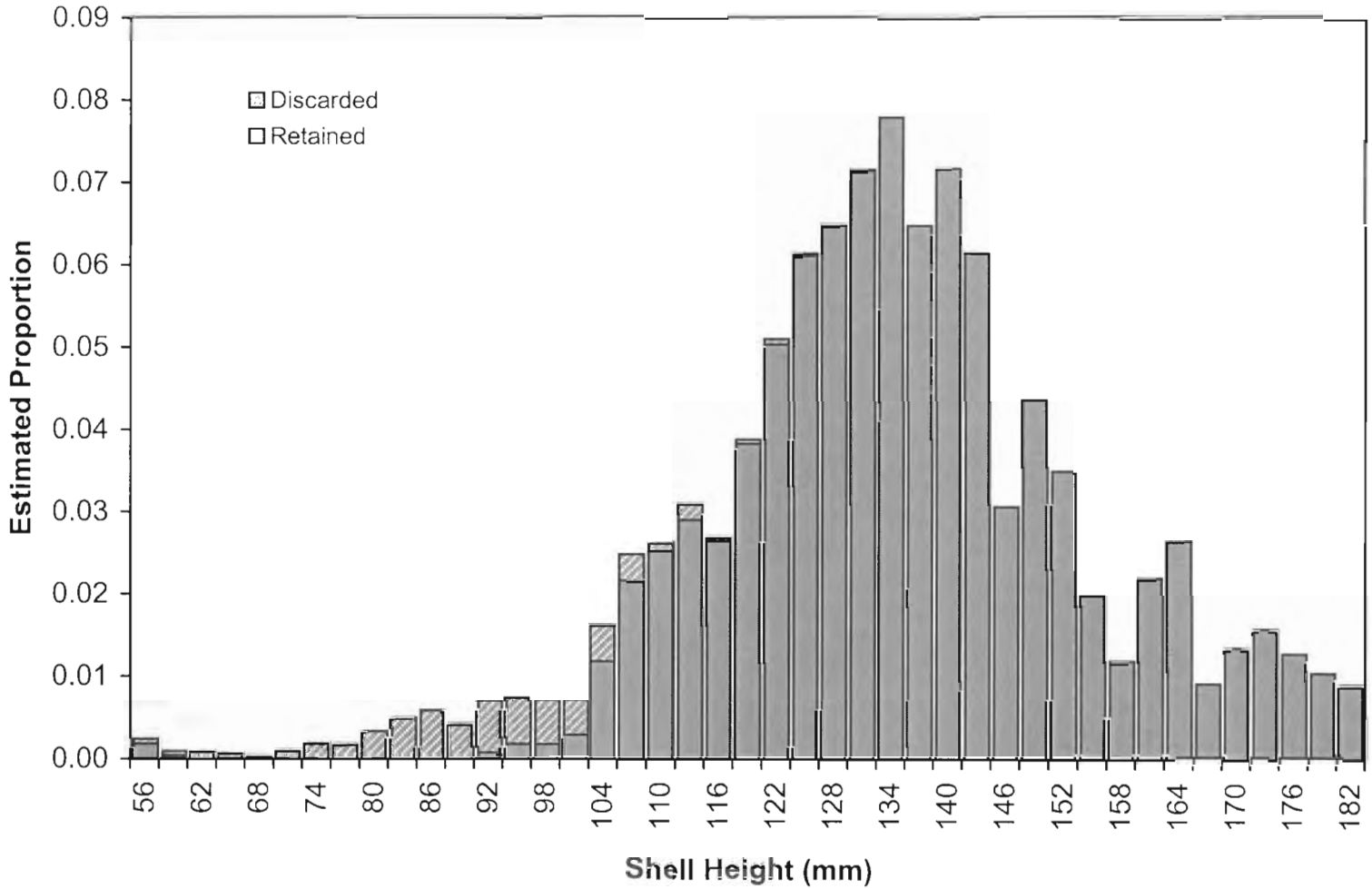

Figure 36. Estimated shell height distribution from resampling observer scallop measurements (males, females, and undetermined sex), Alaska Peninsula Area, 1997/98.

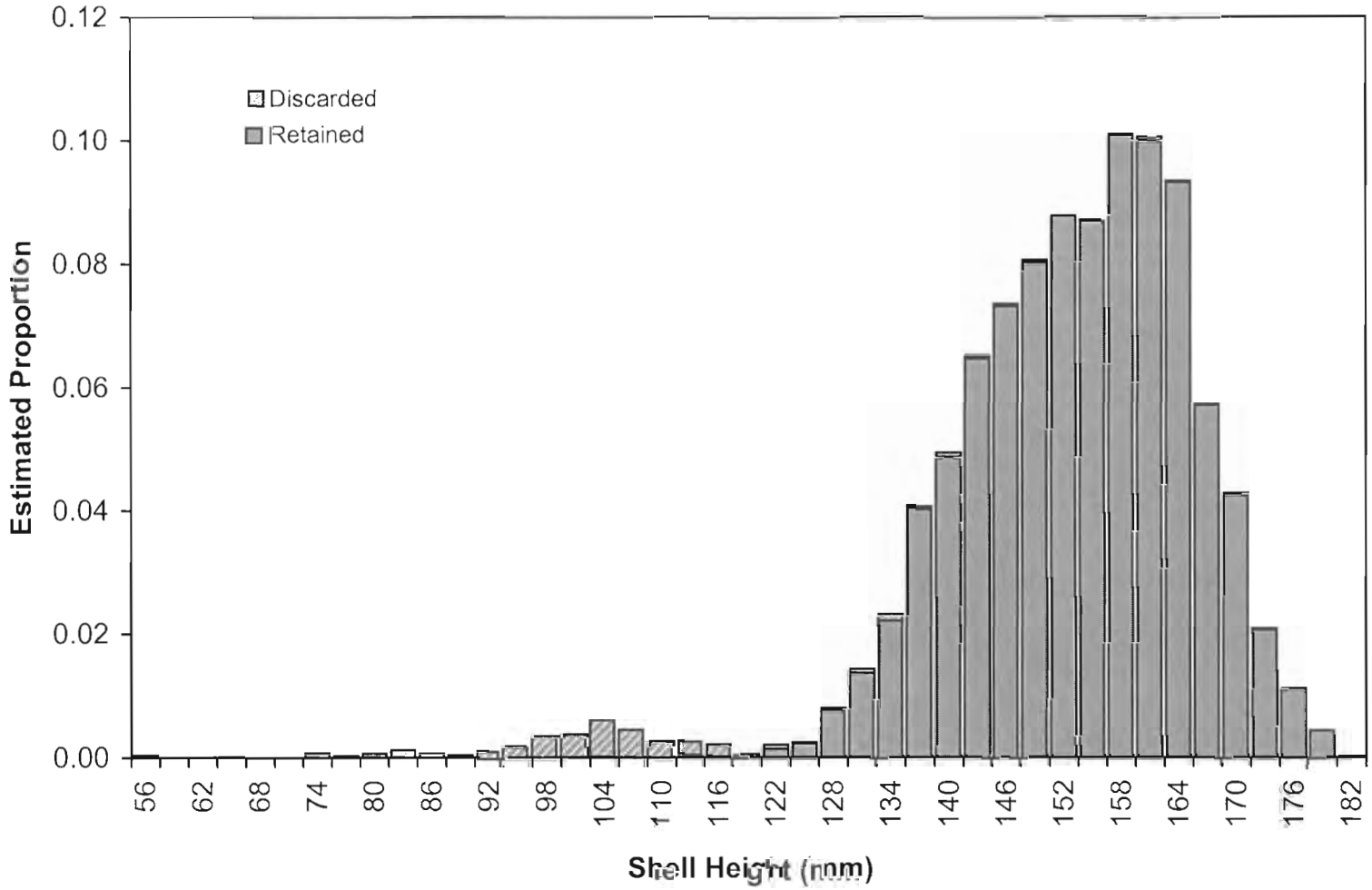

Figure 37. Estimated shell height distribution from resampling observer scallop measurements (males, females, and undetermined sex), Bering Sea Area, 1997/98.

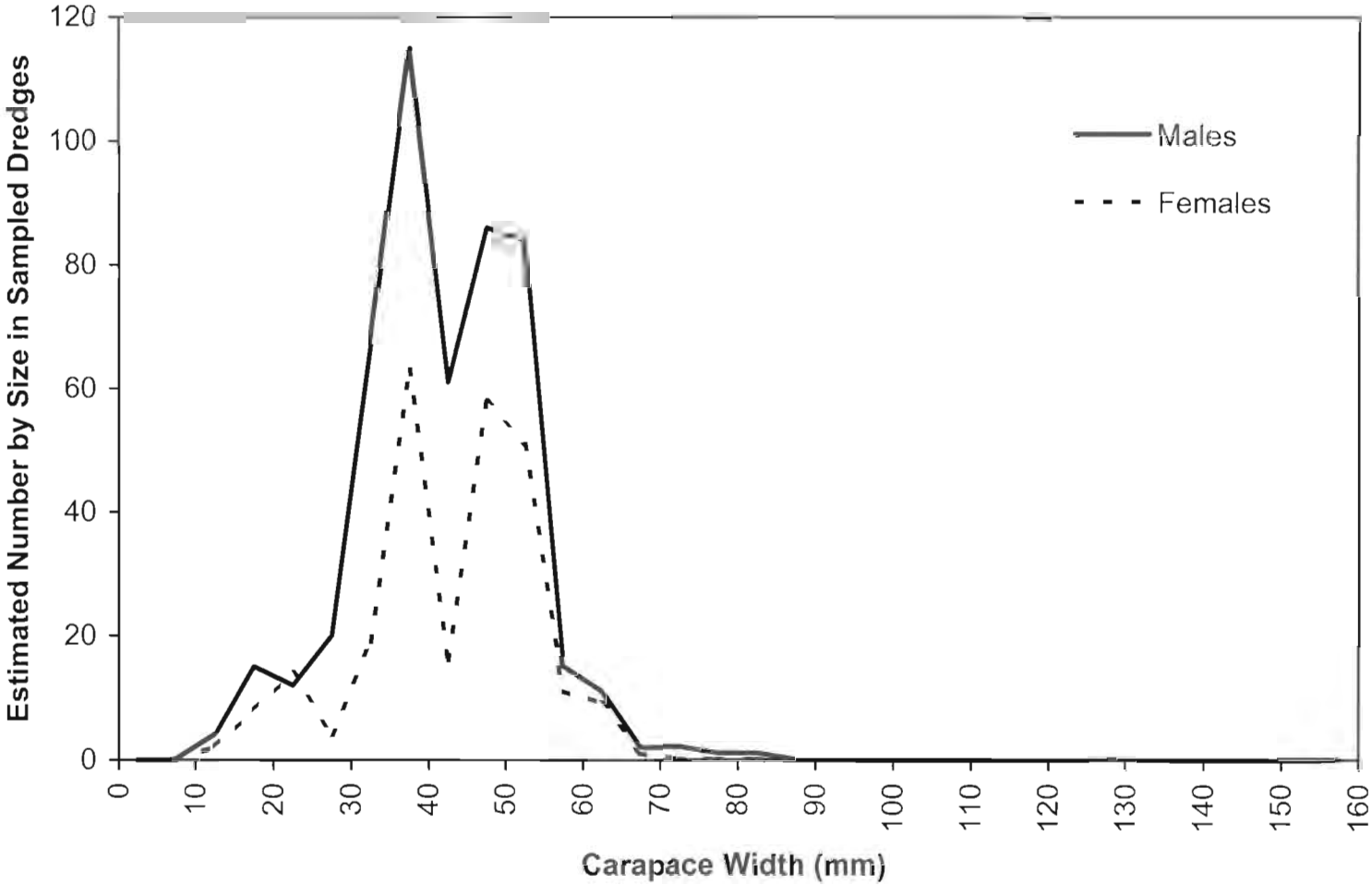

Figure 38. Tanner crab carapace width distribution observed in bycatch sampling, Yakutat Area, 1997. Sample size was 507 males and 263 females.

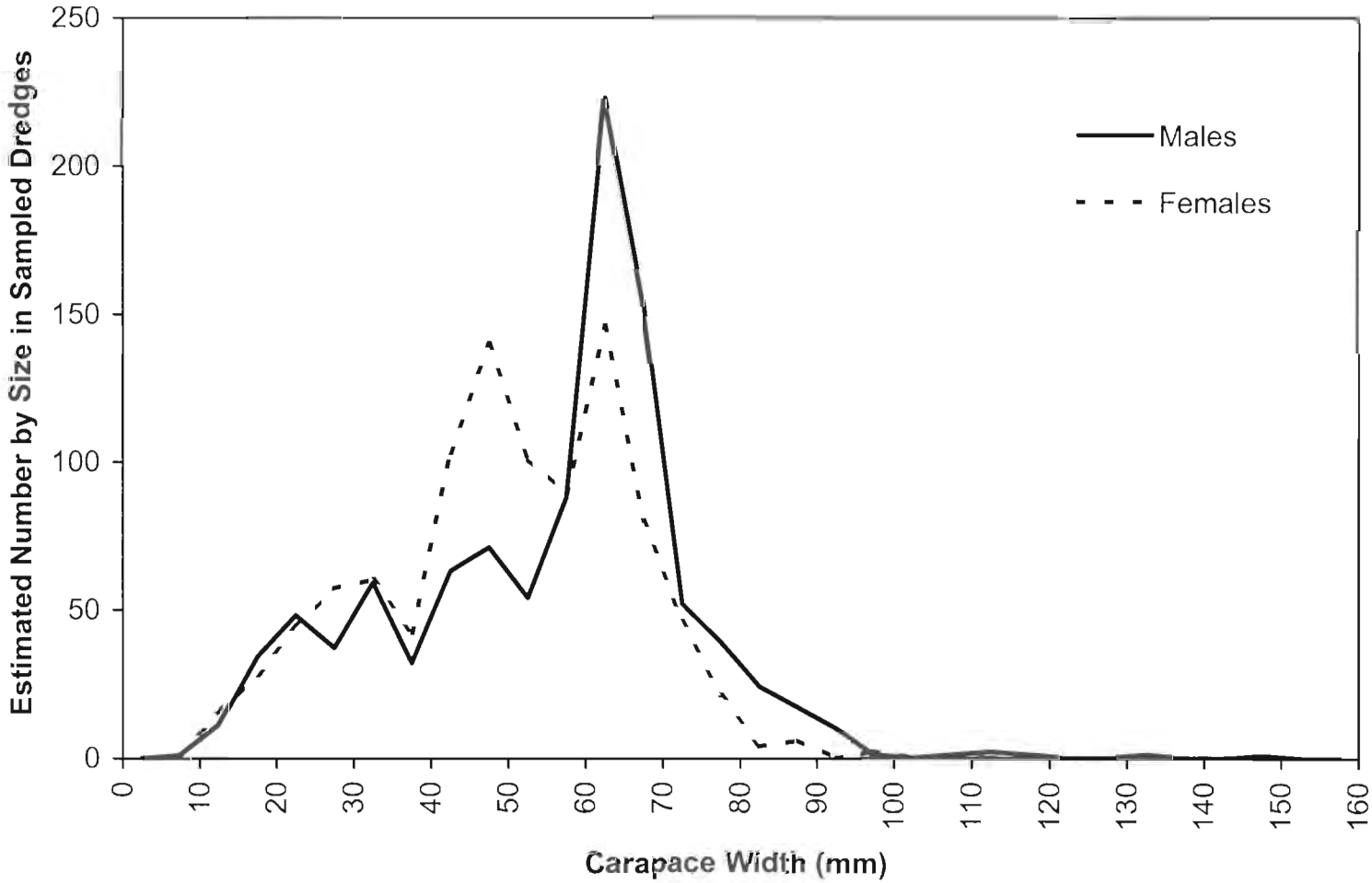

Figure 39. Tanner crab carapace width distribution observed in bycatch sampling, Northeast District, Kodiak Area, 1997/98. Sample size was 1,021 males and 985 females.

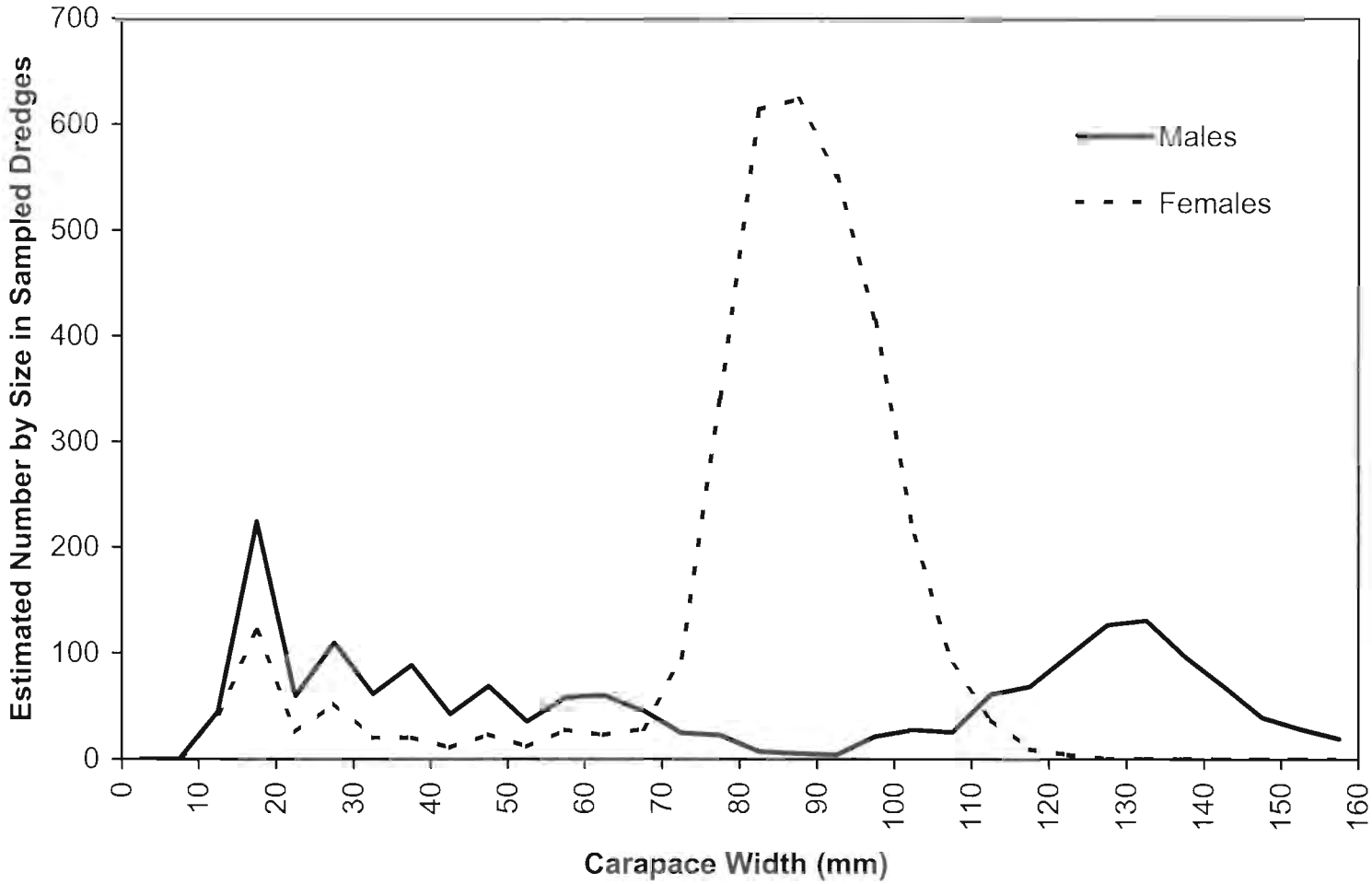

Figure 40. Tanner crab carapace width distribution observed in bycatch sampling, Shelikof District, Kodiak Area, 1997/98. Sample size was 1,771 males and 3,384 females.

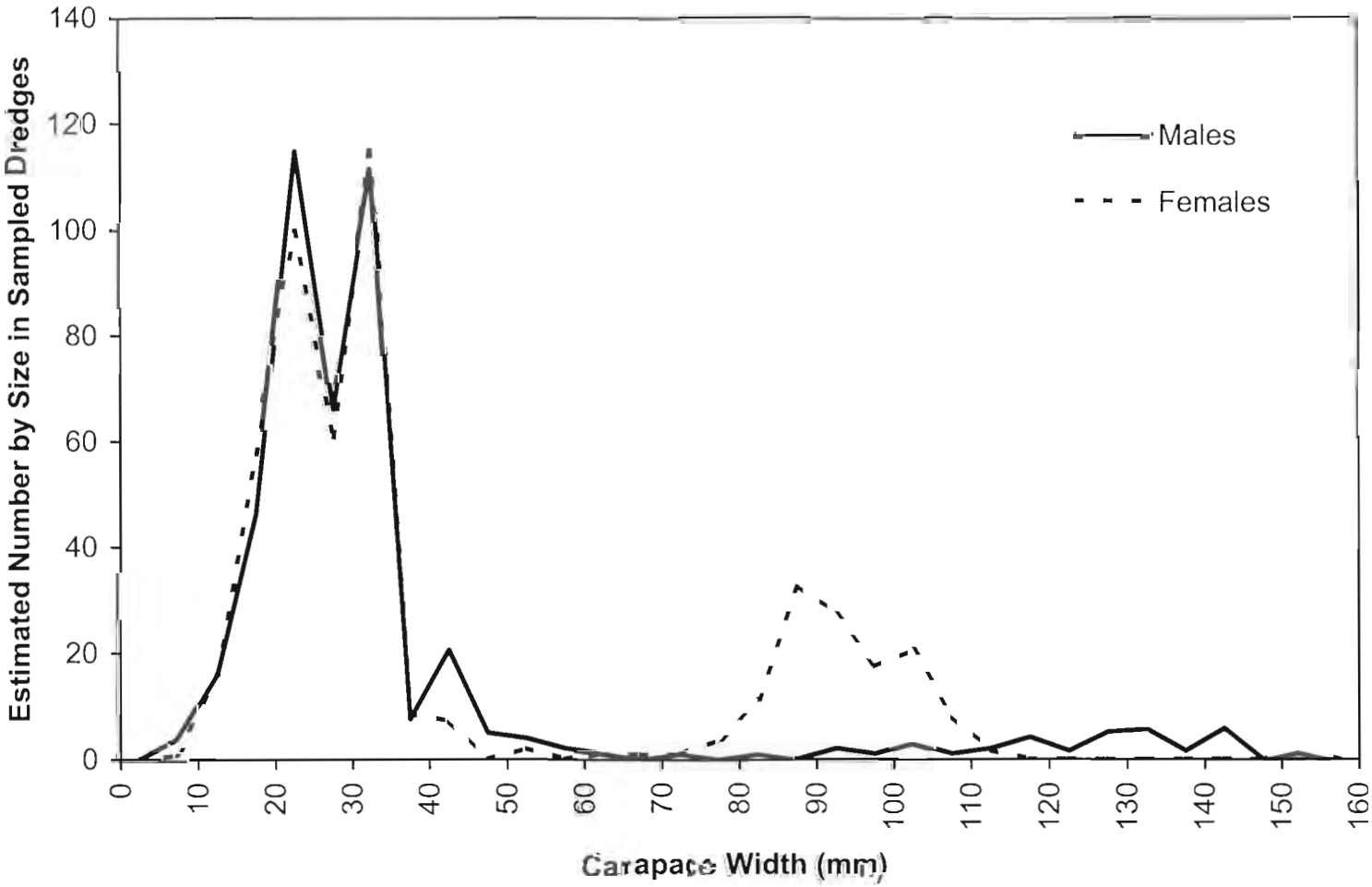

Figure 41. Tanner crab carapace width distribution observed in bycatch sampling, Semidi District, Kodiak Area, 1997/98. Sample size was 411 males and 438 females.

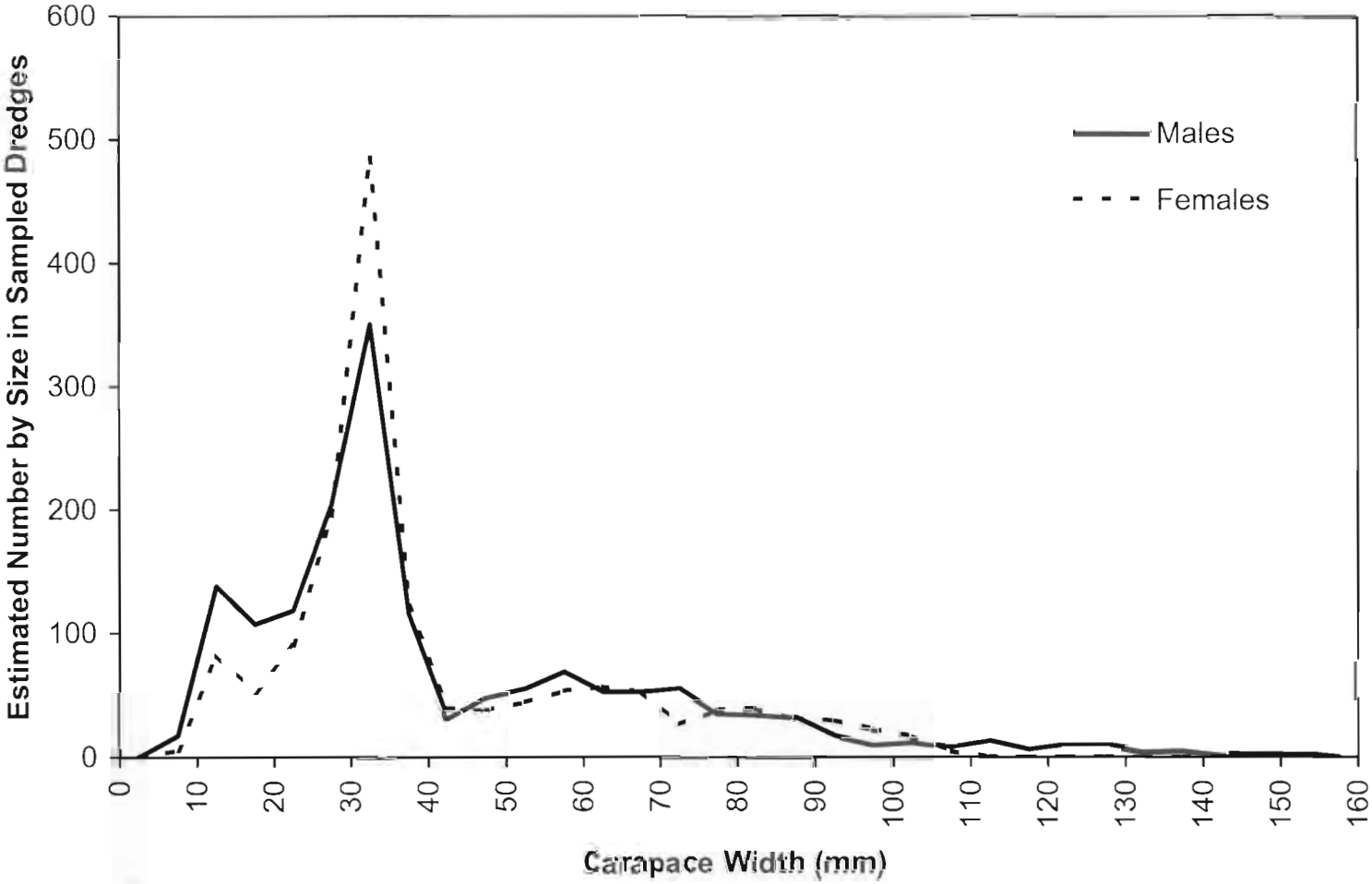

Figure 42. Tanner crab carapace width distribution observed in bycatch sampling, Alaska Peninsula Area, 1997/98. Sample size was 1,589 males and 1,512 females.

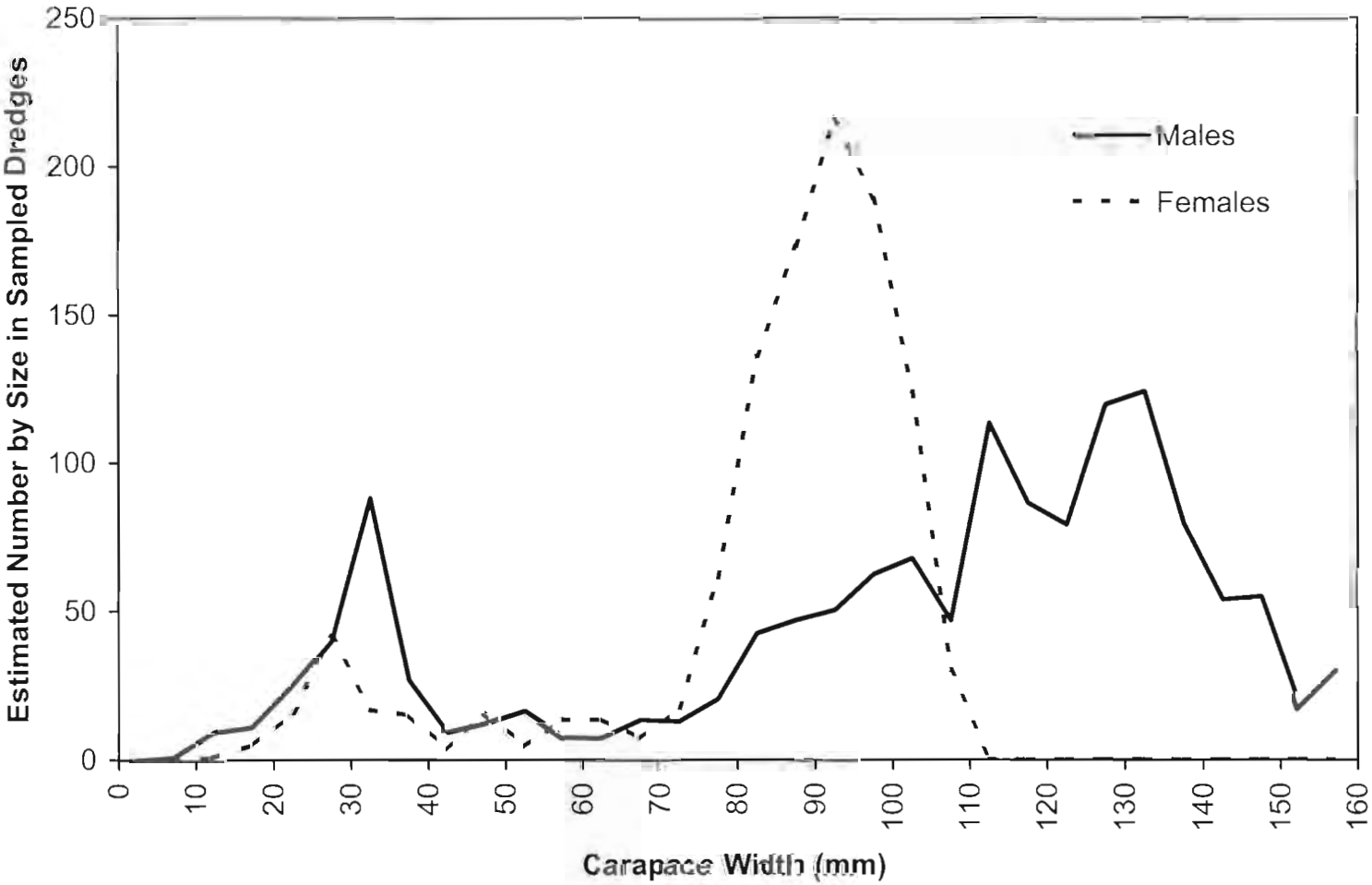

Figure 43. Tanner crab carapace width distribution observed in bycatch sampling, Bering Sea Area, 1997/98. Sample size was 967 males and 859 females.

Figure 44. Snow crab (C. *opilio* and hybrid) carapace width distribution observed in bycatch sampling, Bering Sea Area, 1997/98. Sample size was 10,114 males and 1,565 females.

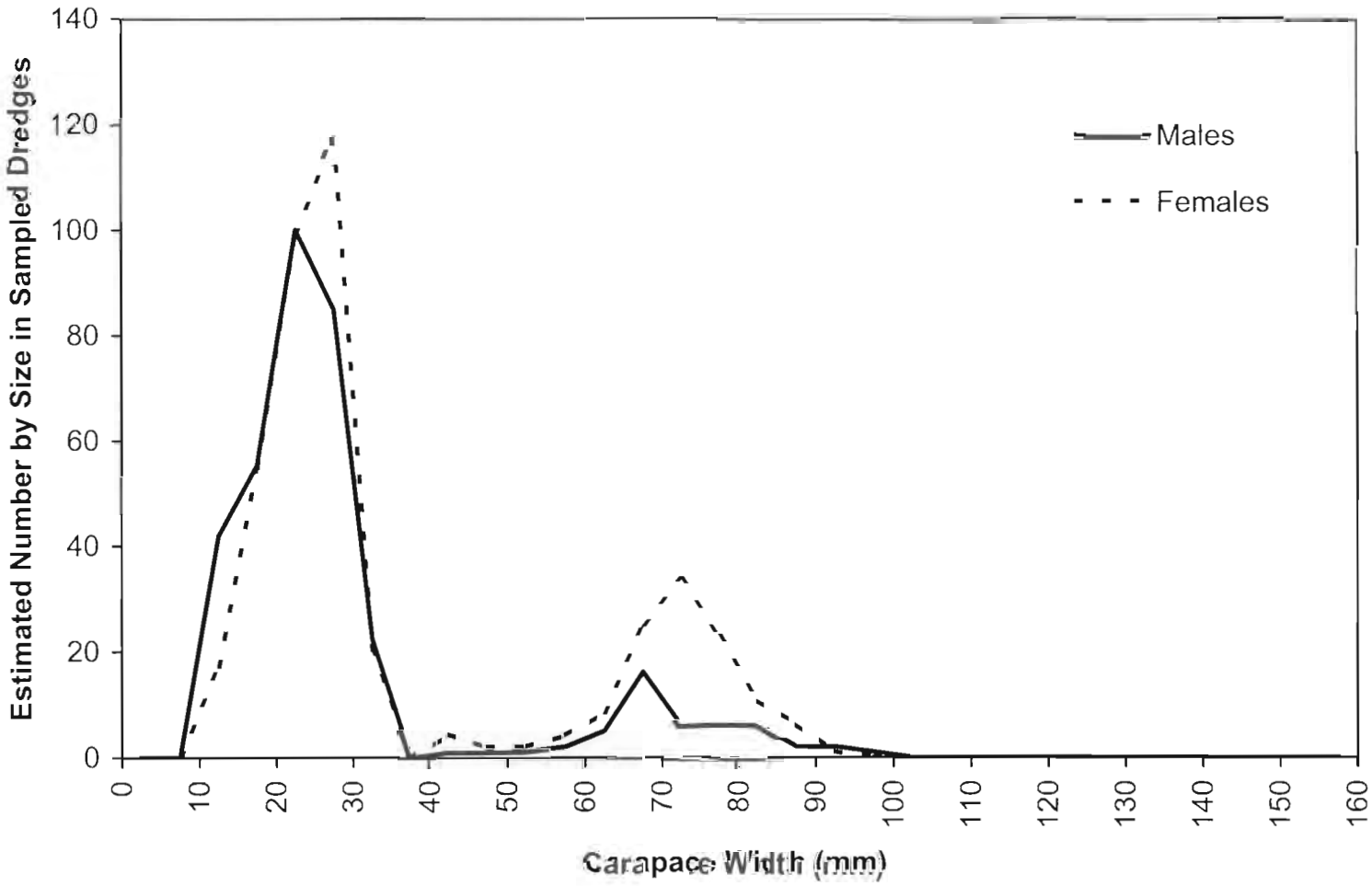

Figure 45. Tanner crab carapace width distribution observed in bycatch sampling, Dutch Harbor Area, 1997/98. Sample size was 333 males and 406 females.

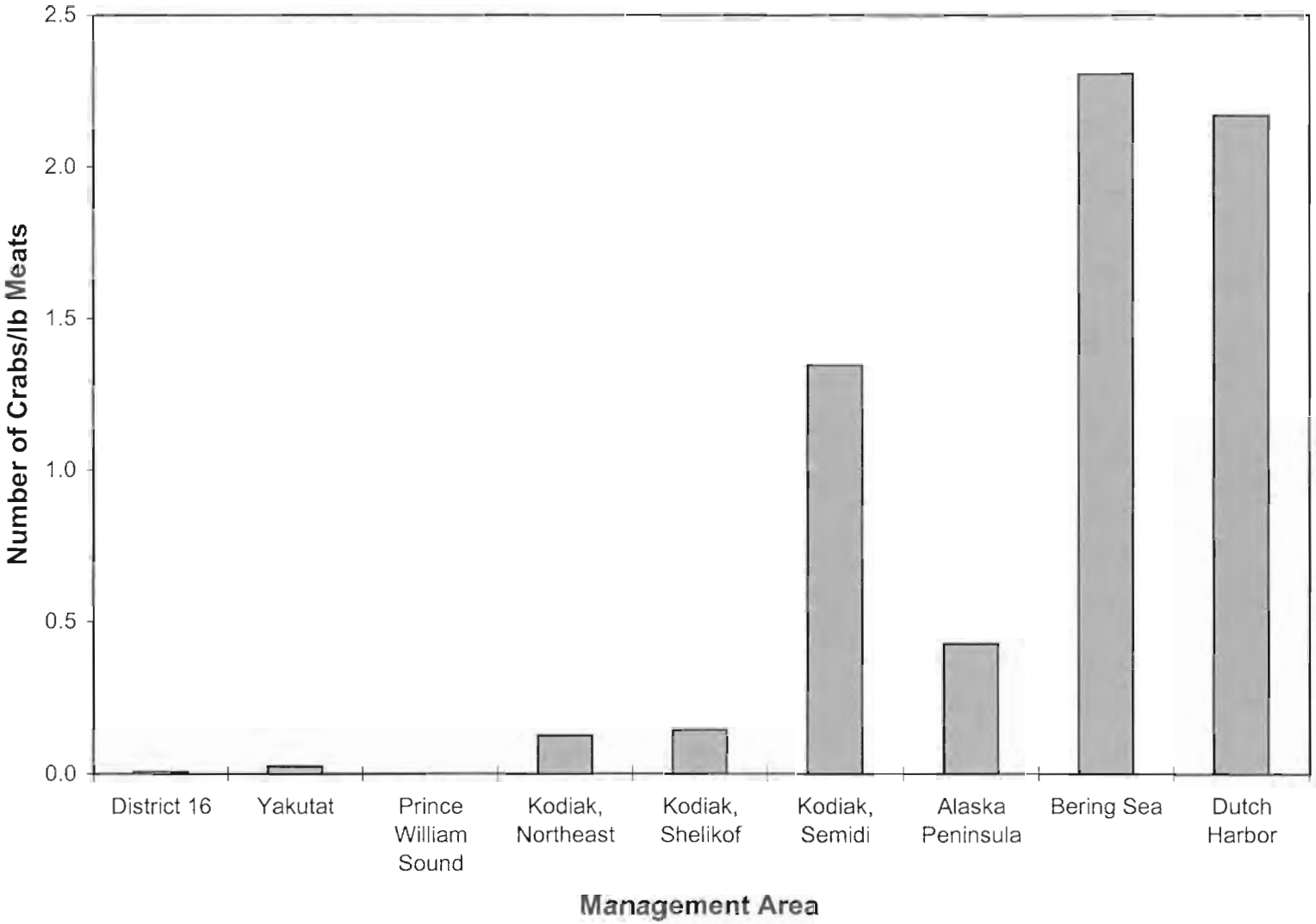

Figure 46. Catch of Chionoecetes crabs per pound of retained scallop meats by management area in the 1997/98 scallop fishery.